SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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Original Correspondence.

NATIONAL RELIEF OF DISTRESS CAUSED BY MINING ACCIDENTS.

SIR,—It occurs to me that the machinery existing in the Post Office is sufficient to work out this scheme.

I am of opinion that the object desired would be best carried out by Government establishing an Accidental Death Assurance Scheme, where a person could insure 50*l.*, or a weekly sum, in case of death or accident.

The premium could be paid quarterly, and entered by the Postmaster, in the same way as is now done with the Savings Banks Scheme, and this book and certification from a respectable medical man or registrar, as the case may be, would be authority for payment.

It would be optional for a man to insure for any amount.

It does not matter very much whether the mineowner or the miner pays the premium. If the latter his wages must be in proportion to pay the premiums called for by the extra risk of accident; if the former, then he will pay the miner so much less wages.

As a matter of course, if the owner effected the assurances he might stipulate that the sum realised be paid by weekly instalments in any case.

What is wanted, then, is to ascertain what would be a fair premium

There exists throughout Northumberland and Durham collieries a system of "smart money" or allowance made to workmen who are disabled at collieries. This has been in operation, I should suppose, from time immemorial, and will afford a basis for calculating the probabilities of accidents.

We have another source of information—the Accidental Death Assurance Company, where by an annual payment of 5*l.* 5s., or less, 1000*l.* may be secured in case of death by accident, or 1*l.* a day while disabled.

Taking this last data, and saying 100*l.* for a fatal accident and 2s. a day while off work, 10s. 6d. a year would be sufficient payment.

At all events in these two instances we have the grounds for approximate data, both of which are reliable.

I am satisfied that, so far as miners are concerned, the yearly payments would not reach 1,000,000*l.* per annum, at 100*l.* for each death.

The fatal accidents in and about mines average less than 1500 annually. Supposing the accidents to be five times that number, and that each got 100*l.*, there would be—

1500, at 100*l.*	£150,000
7500, at 100*l.*	750,000
Total	£950,000

If the scheme were taken up by Government it would lead to no great increase in the work of the Post Office, and, as the whole machinery is already in operation for receiving and paying money, there would be the least possible additional expense, and in this way all the staff and expense of a separate establishment would be saved, besides the security would be so much better.

The benefits of such a scheme need not be confined to miners alone, but might be taken advantage of by all workmen.

AN ENGINEER.

ON THE CONSUMPTION OF FUEL FOR MINING ENGINES.

SIR,—Mechanical appliances for supplying coal to steam boilers are now much used in the colliery districts of Durham and Northumberland; their adoption, it may be stated, does not seem to give any more economy of fuel than by hand firing. The two appliances that are used are Juckes's revolving fire grate and Vicars's mechanical fire-grate; but the former is generally adopted. Juckes's fire-grate is made from 6½ to 8 ft. in length, and about 4½ ft. in width; they usually revolve from 8 to 10 ft. per hour; the speed can be varied to suit the kind of fuel that is used, whether large or small. The whole of the machinery is fixed on a frame, running on wheels, so that the entire apparatus, with the fire, can be withdrawn or replaced in a short time. The principal advantage obtained from Juckes's fire-grate is the prevention of smoke, and this is done more perfectly than by the most careful hand firing. Another advantage is that from one boiler a much larger duty is obtained than by hand firing. As much as 50 per cent. more steam is got in some cases, though with a proportionate consumption of fuel, so that two boilers, fired with Juckes's grates, would equal three with hand firing. There is apparently no economy of fuel, but less boiler space is required to do the same work, and the saving of labour is considerable.

Experiments have been made with the boilers in connection with colliery engines, showing the evaporation of cylindrical boilers, 37 ft. long, 6 ft. in diameter, steam pressure 32 lbs. per inch, fired with Juckes's grate and flash flues, the boilers covered with non-conducting composition. The evaporation was 4·45 gallons per minute, and 5·33 lbs. of water evaporated by 1 lb. of coal; the fuel used in this case was the smallest refuse coal; the feed water was at 45° temperature; water gauge in chimney, ·3 in.; the average consumption of coal was 21 lbs. per square foot of grate per hour.

Further experiments at another colliery—hand firing and using the same description of fuel, with cylindrical boilers 33 ft. long, 7½ ft. in diameter, covered by a shed; steam pressure, 12 lbs. per square inch; feed water, 60°; water gauge in chimney, ·40 in.; fire-grate, 19½ ft. area; chimney, 70 ft. high. With a boiler set with wheel flue—that is, flues going around both sides of the boiler—the evaporation was 4·8 gallons of water per minute, or 5 lbs. of water evaporated by 1 lb. of coal; 25 lbs. of coal per hour used per square foot of grate. With a boiler set with flash flue 7·1 gallons of water were used per minute; 6·69 lbs. of water evaporated per 1 lb. of coal; 26 lbs. of coal used per hour per square foot of grate; the heat escaping at the chimney flue was 617° in the last trial.

Another boiler, fitted with Vicars's self feeding fire-grate and flash flues, gave the results of 5·3 gallons of water used per minute; 7·15 lbs. of water evaporated by 1 lb. of coal; 22½ lbs. of coal used per hour per square foot of grate; the fuel in this case was the smallest description of coal, similar to that in the first experiment, containing ash and other impurities. Another trial on the same boiler with duff or dust coal gave 4·7 gallons of water used per minute; 6·84 lbs. of water evaporated per 1 lb. of coal; and 21 lbs. of coal used per hour per square foot of grate; water gauge in chimney, ·40 in.; heat at end of flue, 490°.

Another boiler, fired with Juckes's apparatus with flash flue, small coal used, gave the results 6·3 gallons of water used per minute; 5·9 lbs. of water evaporated by 1 lb. of coal; 22 lbs. of coal used per hour per square foot of grate; water gauge in chimney, ·40 in.; heat at end of flue, 702°. These may be taken as average examples of the duty of boilers at the collieries of Durham and Northumberland.

The experiments by hand firing give 5 lbs. and 6·69 lbs. of water respectively per 1 lb. of coal. With Juckes's fire-grate, 5·9 lbs. of water per 1 lb. of coal. With Vicars's grate, 6·84 and 7·15 lbs. of water respectively evaporated by 1 lb. of coal. Compared with the results obtained in Lancashire and other boilers of 10 or 11 lbs. of water respectively by 1 lb. of large coal, the present experiments show a much diminished evaporation. It must be remembered, however, that the small coal contains more ash and other impurities than large coal, the refuse varying from 5 to 18 per cent. in small coal; large coal is less impregnated with this, and, therefore, gives better results. It may be said that theoretically the same amount of heat should be obtained from small coal as from large, but for the reason given above this might be so. Two important considerations have to be attended to in the use of small coal—1. To have the coal properly cleaned.—2. To get the air sufficiently through the fuel to effect its consumption. The use of small coal requires a stronger draught and water gauge pressure in the chimney to force the air through the particles of fuel; if this can be done there will then be effected complete combustion of the fuel, as much so as if large coal were used, which requires less draught in the chimney.

Another drawback to the experiments detailed above is the fact of the boilers being fed with cold water. The feed water can easily be heated by the waste gases in the flue to a temperature of 160° or more, and thus materially assist the evaporation of the boiler.

The writer does not consider the experiments conclusive as to the efficiency of the flash flues. The boilers at most ironworks in the Cleveland district are of the length of 60 or 70 ft., and set with flash flues. The great length of these boilers will give sufficient space for the absorption of most of the heat from the products of combustion. This, however, will not apply to boilers 33 ft. in length; the escaping gases must be at a high temperature, and a proportionate loss of heating power will ensue. It may be asserted that the escaping gases should have a temperature of about 300°, this would settle the question whether wheel flues or flash flues were most economical in evaporative duty of boilers.

It will be observed these experiments were made with the view of determining the relative economy of firing boilers by hand or by mechanical means, the same kind of coal being used, with one exception. No advantage seems to be shown in favour of Juckes's fire-grate on this point. The evaporation with this apparatus was 6½ gallons per minute, and in one case with hand firing it was 7 gallons per minute, the consumption of fuel being in about the same proportion, but this is contrary to the experience of others. If Jucke's grates are lengthened to 8 or 8½ ft. a much higher rate of evaporation will ensue, the consumption of fuel being in the same ratio. The average consumption per hour per square foot of fire-grate in those experiments is about 21 lbs. This is above the average of good boilers, and is not in accordance with the best results, where the greatest weight of water is evaporated by 1 lb. of coal.

To illustrate the value of small coal as compared with large for firing boilers, it has been proposed to use ground coal in the form of dust in a combustion chamber. The proper supply of air for the combustion of the coal is blown in with it. This method of firing would have the advantage of not exceeding the requisite supply of air for complete combustion; any excess only operates in cooling the boiler and retarding evaporation.

With regard to the consumption of smoke, it has been accomplished perfectly by both Juckes's and Vicars's apparatus. This has been done also by careful hand firing, extending over short periods, which cannot be relied upon. The adoption of the mechanical self-feeding fire-grate is indispensable where we wish to prevent the nuisance of smoke; it has also the advantage of economising the number of boilers, making two boilers do the work of three. This, with the saving of labour, will be found to embody all the advantages made out in practice.—*Nov.* 26.

M. E.

ECONOMY IN FILLING SKIPS.

SIR,—However much I may deprecate being employed in what is termed a paper war, will you permit me to reply to the letter of Mr Henry Brewer, in last week's Journal, in reference to the above?

I did not for one moment think such an intelligent person as your correspondent "H. B." would have given the readers of the Journal to understand he was cut up by seeing a friendly reply to a former letter of his—which I assure him was written with a pure motive, and the mine in which it was tried for some time, and I am of opinion it proved a failure, as on the alteration of the skip-road the plats, with shoots, &c., to them, were discontinued, and this took place in a mine under the same London management as the mine in which "H. B." is now engaged. The reason I tried it a few years ago, in one of the iron ore mines at which I was engaged was simply this. Not having sufficient experience of its working in Cornwall, it occurred to me as likely to be of some use where the output is so great as in a large iron ore mine; but hematite ore generally being of a rocky nature (as in the oolite formation but little clay is found after the ore bed is met with) the shoot was a constant trouble.

I am glad "H. B." is a Cornishman of such attainments; but in future if he carries on a newspaper controversy to show his ideas to the public do not let the world know you are possessed of one bad quality (unless everyone coincides with your views), and that is passion, which is the true test of vulgarity. No doubt all Cornishmen feel proud to think "H. B." employs his leisure hours to so much usefulness for the benefit of his countrymen; but probably, although only an intelligent pitman, many shareholders would be glad if one-half of his leisure hours were given to study respecting the mine he is engaged at, and its proper development in conjunction with the manager, who is a good fellow, and who will, no doubt, be glad of any assistance, as better results probably might accrue from it, being in a foreign country.—*Nov.* 25.

J. J.

ELECTRIC SIGNALLING FOR MINES.

SIR,—Various propositions have from time to time been made for the use of electricity for signalling in mines, but hitherto very little has been done in the way of introducing it: a system has, however, now been devised by Mr. Gem. Zani, of Highbury, which may, perhaps, remove the principal difficulties. Mr. Zani declares his apparatus is so constructed that the signals desired to be conveyed from one point to another shall be clear and unmistakeable, without the liability to fail. The electricity which he prefers to use is that generated by a magneto-electric machine. In carrying the invention into practice he employs two electro-magnets, the poles of which are placed opposite to each other, and there is sufficient space between them to provide for the reception of a movable armature, which is placed in a vertical position, and works on a pivot, so that it may be alternately attracted to each of the two magnets between which it is situated. To this armature he attaches an escapement device, verge, or pawl, securely fastened so that it may not be affected by the motion of the ship, and which engages with the teeth of a ratchet wheel, which is actuated and caused to rotate by the said escapement verge or pawl, the latter receiving its movement owing to the motion of the armature between the two magnets. To the spindle of the said ratchet wheel an arm or pointer is fastened, and a dial plate is provided upon which the desired words or signals are printed, or otherwise applied. This dial may if desired be transparent, and have a light placed behind it. This instrument or apparatus, hereinafter called the receiving instrument, is placed in a convenient position to be easily seen by the person who has to take his instructions therefrom. The apparatus for transmitting the desired signals to the said receiving instrument is to be placed in a convenient position to be readily operated by the captain or other person who has to use the same.

He proposes moreover to provide, in combination with such a magneto-electric apparatus, two moveable arms or keys, so arranged that upon being operated one of the same will cause the current to pass through one of the electro-magnets in the said receiving instrument, and the other arm or key upon being operated will send the current through the opposite electro-magnet. For operating these arms or keys he forms upon the upper and lower faces of a wheel, which is provided in the magneto-electric apparatus aforesaid for operating the revolving armature, a series of projections, and he prefers to arrange these projections alternately on the upper and lower faces of the said wheel near the edge thereof. He places the said keys or arms in such a position that as the said wheel revolves the projection comes in contact with the said keys or arms—that is to say, the projections on the upper face of the wheel will operate on one of the said arms or keys, and the projections on the lower face of the wheel will operate the other arm or key, so that as the wheel revolves the two arms or keys will be operated alternately, and the current will be caused to travel through the two electro-magnets of the receiving instrument alternately, and thereby the pivotted armature aforesaid will oscillate between the two magnets and operate the ratchet-wheel carrying the pointer. A dial plate is placed upon the said transmitting instrument corresponding with the one on the receiving instrument, and he provides a crank or handle to be operated by the sender of the signals, which crank or handle is attached to the spindle passing through the wheel upon which are provided the aforesaid projections. By operating this handle the sender generates the electricy, and by bringing the said handle over the work or other signal desired to be transmitted the indicator on the dial of the receiving instrument is caused to point to the same word or signal.

He connects the transmitting instrument with the receiving instrument by means of three wires, one of which is connected with both of the said electro-magnets, the two others being so arranged that one connects with one of the electro-magnets, and the other with the other electro-magnet. The current always passes through the first-named wire, and alternately through each of the two others—that is to say, the first-named wire is always a part of the circuit and the two others are alternately in and out of circuit, according as the said arms or keys are alternately operated. The current thus passes first through one electro-magnet and then through the other, and the pivotted armature is attracted alternately to one side and the other. This arrangement effectually remedies the defect arising from the use of only one electro-magnet in combination with a spring to operate the armature in one direction. Another advantage is that the current is always travelling in the same direction, instead of the polarity being changed, as is the case when two wires only are used. He connects a bell with the receiving instrument, and which will ring immediately the transmitting instrument is operated, and thus attract the attention of the person to whom the signals are to be transmitted. He may also use two return wires so arranged that the signals transmitted by the captain or other person sending the same will be repeated on the transmitting instrument, thus enabling the sender of the signals to see that the same were shown correctly on the receiving instrument. Although he prefers to use a magneto-electric apparatus for generating the electricity, he may use a battery for the same purpose instead, in which case the transmitting instrument would have to be modified accordingly, but the necessary modification need not be described, as it will be readily understood by electricians.

A. K. C.

Nov. 25.

DYNAMO-ELECTRIC MACHINES.

SIR,—In the Journal of Nov. 16 you gave an admirable article on the different dynmano-electric machines, and lamps, or regulators, mentioning and describing all those which have been made known to the English public. Allow me to complete that article, by giving you a short description of a lamp, or regulator, which is well known in France, and also to most electricians in England; but not so to the general public, and which is now to be introduced in England, and, no doubt, will be shortly in regular use for lighting halls, rooms, workshops, private houses, &c., as it is so far I know the only one which can be used without mechanical power. This is the lamp known under the name of the inventor and patentee, Lampe Regnier; and, strange to say, but nevertheless quite true it is, that long before we have been startled here by the reports about the wonderful things which Edison's lamp will be capable to do regarding the division of light. I saw myself, in Paris, at the well-known firm of Messrs. Lemonnier and Souttier, in the Avenue Suffrein, very near the Exhibition, 10 of Regnier's lamps, all of them lighted up, and they gave an excellent light, each equal they told me to 80 candle-lamps, which, of course, I could not measure, and I saw that one or more could be extinguished and lighted immediately again without changing in any way the power or intensity of the light of the other; each of the lamps could be moved from one place to another, as well as you move a lamp in which oil or petroleum is burned, or your gas lamp which is connected by a flexible tube with the pipe, the wire, of course, being long enough to allow moving the lamps in this way, and these 10 lamps were worked by one Gramme machine, the smallest size which they make, and which is supplied in Paris at 1500 frs., or 60*l.* (of course, it will be something higher in price in London), and which requires 1½-horse power—and, besides, Regnier's lamps have that very great advantage that they will work by all the various machines hitherto known, be it Gramme, *au courant continuel* or alternative, be it Siemens' or any other. Ladd's small machine, at the price of 16*l.* requiring ½ horse power, will work three of Regnier's lamps—if the battery is not preferred. I hardly have to say that if 1½-horse power gives 10 lights there is less power than 10 times as much, or 15-horse power, required for 100 lights; also, that if less powerful light is wanted 150 lamps instead of 100 could easily be lighted by 15-horse power. Thus we have a division of light just as Mr. Edison promises to give us, and we had it already quite perfect at the time of the opening of the French Exhibition. I have before me a French journal, dated June 29, 1878, which contains a full description of Regnier's lamps, out of which I will give you a few short extracts:—

"This electric light of Regnier's lamp is so beautiful; up to now no one dreamt of being able to get such a light without much difficulty in his own house. Photographers, for instance, how thankful they will be to get such a light without steam or gas engine."

"We assisted at a very interesting trial. With four Bunsen elements we got a beautiful electric light. You put the battery in a corner or in a cellar, and you are sure to have a splendid light (*splendide et eclatante*, it is said in the text), and if put in a globe (or shade) the light is soft, and does not throw on the people that white tone which electric lights generally give."

"A few words only to explain the new lamp. If we put in the circuit of an electric battery some platinum wire which is heated, it gives off a white light. If instead of the platinum wire we use a rod of carbon this becomes incandescent, and we have the electric light. This is well known. In Regnier's lamp the carbon is contained like the wick of a lamp. If much light is wanted the wick is put higher, that is, you increase the incandescent portion of the carbon rod, and diminish it when less is wanted. To extinguish it it is only necessary to interrupt the current. To light it a touch on a knob completes the circuit again."

"The expense for carbon is about 1d. per hour. A carbon rod 12 in. long, lasts about three hours. In this way, without any mechanical power, with only a battery of four or six Bunsen elements, anyone may have an electric light in his own house."

"If the battery is in the cellar the wires can be carried into all parts of the house, and in this manner small hotels and villas can be lighted throughout. The carbons need only to be replaced daily, just as in former days new wicks had to be placed in the lamps."

There is another article in another French paper—La Nature, in the number of August 24 last (long before we heard of Mr. Edison's alleged invention). A description of Regnier's lamp was given, from which the following are extracts:—

"This lamp gives a clear and white light with four Bunsen elements. With a more powerful means of obtaining electricity, several lamps on this system may be lighted, and thus obtain what is called the division of the electric light. The following experiments were made by me before the Physical Society of Paris. With a battery of 36 elements four lamps were supplied. I extinguished and lighted them repeatedly."

I have only to add that the Regnier lamp is similar to Werdermann's, which has been exhibited a few weeks ago at the British Telegraph Manufactory in the Euston-road, but that Regnier's lamp has existed a long time before Werdermann's; Regnier's patent is also older, and further, in a short time I expect to send you a drawing of the lamp, with full description and report of an exhibition of the lamps. In conclusion, the patentees have put the exclusive sale of their English patents in my hands, and I shall be happy to reply to any enquiry about them.

LOUIS SIMON.

Wellington-circus, Nottingham, Nov. 23.

ROCK-DRILLS.

SIR,—It may not be out of place for one or more of the constant readers of the Journal to give an opinion upon the great difference of design between the Eclipse and the Edwards' drills. To my practical mind there is about as much difference between the two drills in design as there is between the old Brown Bess and the Henry-Martini rifle. It is, however, evidently clear that Mr. Edwards has a mania for taxing other people with pirating his ideas, for if I remember rightly a short time ago I saw in the Journal that he laid claim to the Schram valve and arrangement, as also one lately patented by Mr. Dunn. Mr. Edwards would, indeed, be a clever man if he could supply ideas for all the drill inventors, for indeed they are a somewhat numerous party. To me it would apper that by the course he has adopted Mr. Edwards thinks he can bring his own drill more prominently into notice, but surely this is a poor way of doing so. If his drill be worth anything why has he not accepted the challenges thrown out from time to time? I am afraid, however, he has but little faith in his drill, and wants to gain popularity by a kind of side wind. I am not surprised at this, for on studying the design of his drill I find it so full of defects that it can

bear no comparison whatever to the Eclipse, he later being the most perfect and simple machine of its kind I have ever seen.
Millwall, Nov. 26. —— GEORGE COOK.

ROCK-DRILLS.

SIR,—I am one of those who admired the valve of the Eclipse drill at the Paris Exhibition, and gave it as my opinion that it was unique in its arrangement, and totally unlike any other I have ever met with. I am a practical engineer, having a very good knowledge of rock-drills, and I again repeat that the valve arrangement of the Eclipse drill is unlike any other in existence, Mr. Edwards' opinion and specification to the contrary notwithstanding. I certainly should not like to be the silly dupe who would have to appear before the Vice Chancellor on a charge of infringing the Eclipse patent, and have to rely for my defence on the statement made by Mr. Edwards in last week's Journal. I fear I would have but a poor case. Allow me to put a few questions to Mr. Edwards.—1. Did he ever produce a drill which is like the Eclipse in its valve arrangement?—2. If so, by whom was the drill made?—3. Is it now in existence?—4. If so, will he produce it for inspection? Unless Mr. Edwards can answer these questions in the affirmative, and give proof of his having produced a drill similar to the Eclipse, I must describe his conduct by an unmentionable name. W. THOMPSON.
Wandsworth, Nov. 27.

ROCK-DRILLS.

SIR,—The statements of Mr. H. Williams respecting the trials of several drills at Dolcoath have surprised all impartial witnesses. I was present from the beginning to the end. Allow me to inform your readers that the required pressure of air by the Eclipse drill is greater than that of any drill there—McKean's, Barrow, or that of Brydon and Davidson's. Common sense will tell any of your readers the less the area exposed to pressure the greater the pressure required. The Eclipse at 25 lbs. pressure is incapable of anything like effect on Dolcoath tinstone of average hardness. Every drill exhibited at Dolcoath except the Eclipse were old and comparatively worn-out machines, or had been long in use, and yet taking the area of the holes drilled others did as well as that. The statement *re* the hardness of the stones experimented upon is alike misleading. The stones were selected promiscuously from the barrows, and put into the ground, not knowing which or what machine would operate on one or the other. The Eclipse drill has now been at work three weeks at West Basset on ground which men would drive by hand at from 6*l.* to 9*l.* per fathom, yet the progress has not excelled hard labour. The much-vaunted Eclipse drill and Reliance Air-Compressor, as exhibited at West Basset, are retrograding from the permanent machines fixed at other mines in the neighbourhood. They are mere toys, which will be found costly playthings. The rapid adoption of boring machines is not promoted by such one-sided statements as those emanating from Mr. Williams. If the Eclipse drill be the first he has seen his praise is not surprising; let him see others, and know what they have done.—*Redruth, Nov. 27.* —— H. W.

ROCK DRILLS—TRIAL AT DOLCOATH.

SIR,—It does not require any great knowledge of human failings to discover in the letter of H. Williams, published in last week's Journal, that he is interested in the progress of the ("toy") Eclipse drill, but a greater perversion of facts than his letter contains cannot well be imagined, as the finished reports of the trial, to which he so flourishingly refers, will prove. In my opinion (and I am not singular in that opinion) the Eclipse toy is a failure, so far as the practical use is concerned, and failed to produce at the so-called trial anything like the results of the McKean and Barrow drills. The latter bored a 1¾-in. hole and deeper with the same pressure of air as the Eclipse; whereas the hole bored by the Eclipse was no larger than one's finger at 13 in. deep, which for all practical purposes is useless. I feel certain that either the McKean or Barrow drills will bore a hole the same size as the Eclipse in one half the time. As a scientific toy the Eclipse has probably no equal, but for all practical purposes it has no future, as the test at West Basset Mine will prove before long. What is wanted in all machinery, especially rock drills, is simplicity combined with strength. The remainder of his letter is too scurrilous and untrue to be noticed by me.—*Plymouth, Nov. 28.* —— ENGINEER.

ROCK BORING MACHINERY.

SIR,—We beg again to ask your kind indulgence to insert this reply to Mr. Edwards, who seems to be beating about the bush like one lost in a fog. At this we are somewhat surprised, seeing that Mr. Edwards advertises himself as a patent agent; but if his ability in his profession is no better than his judgment in this matter we feel sorry for his clients, if any. We now repeat the claim of each patent.

ECLIPSE DRILL.—Having now described the nature of the said invention and in what manner the same may be performed, I declare that I claim—

1.—Arranging a valve, such as is shown at A, to move up a rod or bolt within its valve-box, and providing such bolt or rod with a guide, to prevent the valve from turning round, substantially as herein described.

2.—The use of a rod or bolt arranged substantially in the manner shown, so as to pass through the caps, valve-box, cushions, and valve for the purposes herein described.

3.—The use of ports arranged in the valve-box substantially in the manner shown being carried across to opposite ends of same, so that the exhaust steam or air from opposite ends of the valve may be controlled by the groove or recess in the main piston, as herein described.

4.—The means employed for controlling the valve by the exhaust steam or air from opposite ends of the valve-box, and without having any connection with the steam or air which is in either end of the main cylinder, substantially as herein described.

EDWARDS'S DRILL.—Having now described my invention and the manner in which it is to be performed, I claim—

The methods of actuating the pistons of reciprocating engines by means of an ordinary slide-valve fitting loose upon a bar (which is a square one, see p. 8, line 10, of specification) connecting two pistons, between which the driving fluid is admitted through a single opening, the pistons being actuated by the alternate opening and closing by the principal piston of passages arranged for the purpose, substantially as described and shown in the drawing.

Also, the method of regulating the stroke of the slide-valve, and of working it by hand when required, substantially as described and shown in the drawing.

The foregoing are the claims for the two valves and their arrangements, and before proceeding to claim for the feeding device of each drill we ask any common sense man whether there is any similarity in the two or their arrangements.

In the first place, the valve of the Eclipse drill is one single piece of metal, so designed as to form a piston shape at each end in a circular form, whilst the centre is quarter circle shape, with four faces, supported upon a round bolt having a feather piece. There are no stems, guides, or stuffing-boxes, or any other mechanical appliance to move the valve. The valve-case is circular in form, and has seven ports.

The Edwards's valve is in three pieces, held together by a square bar, with a rod at one end, running through a stuffing-box and guide-piece, and fitted with stops, to prevent the valve being smashed by coming in contract with either end of the valve-box, which valve-box has only five ports or openings.

Unlike the valve of the Eclipse drill, Mr. Edwards's valve is provided with a knob at the end of the rod or stem, in order to enable those working the drill to force it up or down, as the case may be, when it sticks, which is very often the case with valves so constructed. The Edwards' valve is also governed by the live steam or air, which is not the case with the Eclipse valve.

Having now fully described the great dissimilarity between the two valves and their arrangements, we again tell Mr. Edwards we never either intentionally or unintentionally borrowed any ideas from him or any other person to perfect the Eclipse valve or its arrangement; and, further, we defy him to reproduce the Eclipse drill by manufacturing any that he has ever patented; and, if Mr. Edwards is still of opinion that the Eclipse is in any way a counterpart of his he had better take steps to prove the same, the date of his patent being Sept. 30, 1874, whilst that of the Eclipse is Feb. 14, 1878.

As to the feeding device Mr. Edwards speaks of we beg also to state that there is not the slightest similarity—therefore we need not describe it.

We now leave Mr. Edwards to act in any way he may choose or his very fertile brain may lead him, as he and all others have fair warning.—*London, Nov. 27.* —— HATHORN AND CO.

GOLD IN INDIA.

SIR,—Several letters relating to the auriferous quartz reefs of Wynaad having appeared in the Times, it may be of interest to those whose anticipations of a prosperous gold industry in India have been aroused to know what the practical results of the workings of the three companies up to March 14, 1878, were. Quoting from one of the latest reports of Mr. King, Deputy Superintendent of the Geological Survey of India, I find "that the gross amount of gold obtained by the three companies was 271 ozs. 9 dwts 14 grs.; the average yield of gold per ton of quartz on all this amount has been 4·5 dwts.; and this gold has been sold at prices varying from 40 rs. to 45 rs. the ounce. The low average yield is calculated on the whole absolute tonnage of quartz extracted in Wynaad, but it is only fair to give the following averages for each company's working:—

	Tons.		Dwts.
Alpha Company	769·5	gives	2·27
Wynaad Prospecting Company ...	99·85	„	3·02
Prince of Wales's Company.....	322·66	„	10·5."

As yet, an average of 1 oz. to the ton has not been reached. Some stone, however, from Wright's level in the Alpha works has yielded from 11 to 17 dwts. within the last few months. In the face of these facts, surely the statement by Messrs Johnson, Matthey, and Co. of the results of their assays—18 to 816 ozs. of gold per ton—requires to be qualified by the remark that their figures do not illustrate the average yield of gold per ton of quartz crushings, which is the measure of the real value of the auriferous reefs in Wynaad.
Nov. 19. —— THEODORE HUGHES.

MINING IN NEW SOUTH WALES.

SIR,—Although our mining mania resulted (as usual) in loss to the ignorant and foolish, it yet served to help discover several promising fields of operation, and the result has been a good deal of real legitimate prospecting and sinking by *bona fide* miners, the good effect of which is apparent in the following summary for September:—The principal item of mining intelligence for the past fortnight has been a discovery of gold near Queanbeyan, in the southern district of the colony. The place is known by the name of Brook's Creek. Alluvial diggings have been worked there for some time, and have occasionally produced very rich gold, yielding in places as much as 3 ozs. to the dish. The reef just now causing such excitement was discovered by the Brothers Dawson, who have for years been prospecting the locality. Surface indications led them to sink a shaft on the southern slope of Diamond Hill, and in a few feet a reef was met with, showing heavy gold. So far as at present proved it appears to average 10 in. in width, bearing about north 20° west, and showing a strong eastern underlie. Not a piece of stone has been taken from the reef yet that does not show gold, and one fine block, about 1 ft. long by 6 ft. in depth and breadth, is fairly studded with the precious metal. On Friday the prospectors put down a small hole, some 30 ft. north of the main shaft, and at once met with the reef, showing gold as good as where first discovered. The casing is a description of slatey clay, and is remarkably rich in fine gold. A number of claims have been pegged out to the north of the prospectors, and one to the south; but further progress in the latter direction is barred, as the adjoining land is private property. Some rich specimens, said to be nearly half solid gold, have been discovered in a rich quartz reef near Gundaroo. Rich samples of gold have been found in the Bo Bo and Burrell Creeks, near Tinonee, leading to the inference that there must be a reef at the head of these streams, or in the ranges lying between them. At Grenfell unwonted activity prevails. Several new claims have been taken up. The sinking is shallow. The prospects are very encouraging, and it is said that some of the men are earning as much as 9*l.* per week. Some specimens of rich-looking stone have been taken from a gold-bearing reef near Mr. Harlowe's Farm, at Tarrabandra. At Bethanga some good auriferous quartz has been raised, and the copper mines are giving the most encouraging results. In the western district there has been a small rush to the forest near Carcoar, where a lode of pyrites, 6 ft. wide, has been cut, and gold yielding at the rate of 200 ozs to the ton obtained. At the Rocky River the Bullion Company have come upon some ground showing 5 ft. of payable wash-dirt. Several very fine specimens of gold have been obtained at the Mongarlowe gold field—in one case as much as 12 ozs. of gold from half a dish of stone; and the casing of a new reef is said to give a prospect throughout of 1 to 5 dwts. to the dish, the vein being 4 in. wide. The stone from Yallwall, in the Shoalhaven district, has yielded over 1 oz. to the ton. From the Barrington river diggings the news continues satisfactory, and rich prospects are being obtained. The Hill End claims have yielded nothing particularly worth speaking of during the fortnight. In the Bensusan's Copper Mine, at Frogmore, the lodes are yielding stone averaging from 12 to 15 per cent. of copper. Owing to the lowness of the price of tin the Vegetable Creek Tin Mines are very dull; but the Gulf Lode Tin Mine, worked by Mr. W. Carr, as manager for Messrs. Banks and Co., of Sydney, is really a marvel of richness. Mr. Carr is now working a drive in one of his shafts that may actually be described as blocking out tin ore in solid junks; and although the lode as yet carries a thickness not exceeding 1 ft., yet the shaft is but 20 ft. deep, with the lode rapidly widening out with a dip to the west.

The above does not, of course, touch upon all the likely places, as scores of them are beyond the reach of ordinary newspaper correspondents, and also very many parties who are doing well keep their good luck to themselves as long as possible. One thing is certain that mining, in its true sense, has scarcely begun with us yet, and that when capital and energy are brought to bear on our mineral resources we shall have no reason to fear comparison with the most fortunate of other countries. R. D. ADAMS.
Sydney, October, 1878.

FRONTINO AND BOLIVIA COMPANY.

SIR,—Will you kindly permit me to enquire through the Journal if the shareholders of the Frontino and Bolivia Company are again to have the privilege of attending a general meeting? It is now upwards of a year since the last meeting was held, and I think the directors should consider that they are not the only proprietors who are privileged to know the various affairs of the company, notwithstanding the monthly circular, now very tardily supplied, and which consist merely of extracts from the agents and managers in New Granada.—*Nov. 28.* —— ENQUIRER.

PRESENT PRICE OF LEAD.

SIR,—I should be glad to be allowed to suggest through the Journal that a strongly signed petition should be sent to the Chancellor of the Exchequer praying him, as it is inevitable that we must have an increase of taxation, to consider the advisability of putting a tax upon imports of lead, either pig or ore, of 4*l.* per ton, being the same amount that is levied on English pig when imported into America. The imports of pig lead for ten months of this year amounts to 85,000 tons—say, in round numbers, 100,000 tons per annum. We may assume that the levying of a duty of 4*l.* per ton would cause this to fall one-half, or (say) to 50,000 tons, equals a revenue of 200,000*l.*, easily collected. The remaining 50,000 tons could be supplied by this country presuming the price of lead to rise as it would the 4*l.* per ton, or (say) to 14*l.* on average. This would mean a distribution of 700,000*l.* amongst the workings miners, mineowners, and the lords. It would also cause the price of the 60,000 tons of pig-lead, which we at present produce, to increase in value (say) 4*l.*; thus a total of very nearly a million sterling more money would go to support the lead industries of this country, and that without, as far as I can see, inflicting an injustice on anyone.
A LEAD MINE PROPRIETOR.

BRITISH SILVER-LEAD MINES.

SIR,—These mines continue to open out most satisfactorily, and I should strongly advise the investing public to inspect this valuable property. The eastern stope is worth 2 tons of ore per fathom, and is improving as it nears the new shaft which is now worth 3 tons of ore per fathom. The large accumulation of orestuff is being added to daily.—*Wrexham, Nov. 28.* SHARKHOLDER.

THE GREAT NORTHERN RAILWAY.

SIR,—With the appalling City of Glasgow Bank "Katakluesmos," the Banque de Belgique scandal, and the collapse and consequent disclosure of their several years balance-sheets of the largest coal mining company in Scotland, am I "hors de regle" in the overburdened state of the moral atmosphere, strictly eschewing a redundance of style, which may be construed as weakness, in demanding a searching investigation into the much-discussed position of the Great Northern Railway Company? In addition to what I have set forth in my preceding correspondence in the Journal under date of Oct. 19 and 26 and Nov. 2, 9, 16, and 23 respecting this company, permit me to invite attention to the evidence of their late general manager before the Royal Commission on Railways—that "he could not tell the cost of working coal traffic, which was held to be carried at a loss"—with the identical evidence, in April last, by their present general manager, as to equal inability on his part, in the face of their locomotive superintendent's evidence that such is double that of passenger traffic, or as 190 to 100. The Great Northern are persisting in carrying on their coal traffic to London in direct opposition to the system pursued by the dual greatest coal lines—the North-Eastern and Midland—both of which condemn by their *modus operandi* the dogged and unaccountable management of the Great Northern, who have it in their power to carry over their system more than 500 times as much coal as they now carry to London, ensuring them an unassailable largely augmented aggregate revenue by shipping the coal for London *via* Boston into barges, to be loaded into steamers at Clayhole, by which route a saving is effected of 5s. a ton upon rail transit and attendant expenses from the pit's mouth to the metropolitan consumer's premises.

But this would not suit their well met companions, the Great Eastern, who will have to render an account for the application of so much treasure to gain access to the coal fields in the face of their general manager's evidence in April last that "they cannot compete with seaborne traffic," which they are fully aware is projected *via* Boston and Keadby, invading not only their ports of Yarmouth, Lowestoft, Harwich, Ipswich, Manningtree, Colchester, Maldon, and Southend but the whole of their metropolitan rayon and their inland towns, as Norwich, &c., at an immense reduction upon what they can effect by rail. The vaunted transport of "green peas to the colliers" will never remunerate the outlay for such purpose, and coal they will never get to do it. With the evidence of one of the most eminent men before the Royal Commission that "the whole action of the railway directories had been one of gigantic failure," and with the aphorism of the late Mr. Robert Stephenson in his inaugural address as President of the Institute of Civil Engineers, "What we want is knowledge," it becomes the duty of the Great Northern shareholders to assure themselves by a committee of investigation of unbiassed experienced men as to the actual position of their undertaking, especially after what I have brought under their notice during the last few weeks in the Journal.

Let no further parliamentary outlay take place before they are assured by such committee of not being for some time engulphed in an abyss of insolvency. As a gradient in the atmosphere is ascertained by barometrical observations taken at different places at the same time, so is the true position of the King's Cross undertaking to be arrived at by diversified evidence from wretchedly underpaid officials as compared with the first-floor occupants at King's Cross, unable to state the cost of coal traffic, which the startling statement of a subordinate elucidates. It is a well-known fact, and admitted by the North-Eastern, that they worked at a loss as well on haulage as terminals at one period, and are the public to hesitate in demanding a committee of investigation into the doings of a railway company who, according to evidence before the Royal Commission on Railways, carried second-class passengers at half-a-farthing per mile, and in opposition to the London and North-Western carried passengers at less than one eighth of normal rates? The Great Northern has contributed largely to the loss of 100,000,000*l.* sterling in competitive or internecine war between railways in this country, as reported by an eminent French Government delegate to enquire into the working of English railways.
WILLIAM JOSEPH THOMPSON.
6, *Fitzwillam-road, Clapham, Nov. 28.*

MINING IN IRELAND, AND CHEAP TRANSPORT.

SIR,—The great and all-absorbing problem of the day is cheap transport, and no country is in this respect more under the ban of mining, industrial, and agricultural isolation than Ireland. I have given deep study to this subject, and had the privilege of contact with the most eminent mineralogists *in loco* in Ireland, embracing the important mining interests in the county of Wicklow and South-West of Ireland. I propose to effect the transport of mineral products from the mines to Swansea, &c., at less than one-fourth of the present cost. I brought my system of transport under the notice of readers in the Journal of Sept 22 last year, to which I respectfully refer, and I feel myself fully justified in setting forth my ability to prove to the man of science, statesman, capitalist, or industrial that engrafted in the gravitation system I possess an auxiliary self-maintaining power amply sufficient to carry the load over the summit of the ascending plane, and so continuously without reference to distance. It is admitted by practical men and the most eminent mathematical and physical celebrities whom I have personally consulted in Russia and Germany that there is no difficulty in attaining 80 per cent. of the ascending plane. The distinguished practical engineer the late Mr. Nicholas Wood, who has had more than any of his contemporaries to do with transit on incline planes, has handed down to posterity in unmistakable language the most complete evidence in favour of the capability of surmounting the entirety of the ascending plane without recourse to any direct auxiliary force. The report of the Royal Commission appointed to enquire into the application of iron to railway structures, in referring to "the startling and unexpected results attained under their experiments on the most extended scale" proves the same, but to disarm all contention and preconceived notions two of your contemporaries, who have carried on a lengthened discussion on the "Laws of Motion," agreeing upon the difficulty there exists to arrive at just conclusions respecting the laws of friction as set forth in most text books, I, with unfeigned humility, accept the admitted fact of 80 per cent. being assured. To surmount the complementary 20 per cent. I possess, as precited, an auxiliary, self acting power, human manipulation being rejected as unreliable with the great speed incidental to the system. The vehicles having the centre of gravity below the rail enjoy perfect immunity from disaster with equable motion.

With the adoption of my system, entailing an incomparably lesser cost of construction and comparatively nominal working expenses, a new era will burst forth in Ireland, whose brilliant future is chiefly impeded by a defective system of transport for her mining products, agricultural produce, and industrial development, as well as unsuitable rates of locomotion. Inasmuch as all the great naval architects, Spanish, Swedish, &c., agree that a ship ought to be constructed with especial reference to the sea she is destined to navigate, in the same sense in the laying out of lines of railway, the abundance or paucity of capital, the rate of wages and living of the population, the greater or lesser degree of population, the exuberance or otherwise of so-called goods traffic deserve strict observation and adaptation. It is evident that existing lines of railway have entirely failed, and that a system is ardently sought for which

will, by rates impossible to attain by existing systems, develope the immense mineral deposits of this country. The great desideratum of cheap coal will be ensured many shillings per ton under existing prices on the seaboard and interior of the country.

WILLIAM JOSEPH THOMPSON.

6, *Fitzwilliam-road, Clapham, Nov.* 26.

MINING IN IRELAND—WEST CORK MINES, &c.

SIR,—During a recent journey through the South-West of Ireland, from Cork to Crookhaven, &c., and from thence across the country to Kerry. I devoted some time very pleasantly—and eventually it may be profitably—to an examination of the West Cork mining districts; and I regret to say that the depressed state of trade and business, together with the very low price of copper, has for the present all but closed all the mines, and put an end to all speculation, good or bad. I cannot imagine that things will get worse, and it occurs to me that it would be a safe and profitable move just exactly at this time to pick up a few mines which I shall not herein particularise, but which will be found in the districts I shall briefly attempt to describe. I find that there is a great copper zone, or belt of copper lodes, true east and west mineral veins, traversing the district from Brow Head to Roaring Water, a distance of about 20 miles. The strata of this district consist of clay-slate (killas), intersected by elvan courses or dykes, cross-courses, flookans, caunter lodes, &c., also greenstone formations; these, with the rough massive slaty grit rocks, are, I believe, the most metalliferous of all known rock formations. With one exception, the mines of this district have only been comparative surface diggings, but a shaft 220 fms. deep in a lode of copper ore and soft spar, 10 ft. wide, is not a bad sign of the district; this is the only instance where depth has been attained, and the results could not be more favourable. I have seen copper ore from those mines equal in quality to the ore of any mines in the world, and also splendid specimens of malachite. The water charge in the mines is trifling; the ground requires but little timber. There are safe harbours all along the coast near the mines where vessels can ship and discharge cargoes, thus in most instances saving all land carriage. Rich ore occurs in the lodes near surface, so that quick returns may be made. Some people will say that money has been lost in the mines in question; this may be true to a certain extent, for money no doubt has been lost, but it is hardly fair to debit a mine with the loss of 10,000*l.*, when in reality only 1000*l.* was expended; this is, however, a fair illustration of the mode of applying capital to the working of the West Cork Mines. What became of nine-tenths of the capital subscribed is known only to a select few. It is useless, however, to cry over spilt milk, although it is poor consolation to those who have subscribed thousands for working Irish mines to discover that a tithe only of their capital was actually expended therein. I have ascertained that wherever a small amount of capital was judiciously expended, there was profit realised on the outlay. With previous warnings and experience the capitalist may realise handsome profit on his outlay.

Mount Gabriel is thrown up some 1400 ft. above the sea level, and forms the centre or nucleus of a great and important mining district. At its base on the south is the great copper zone or belt of lodes, forming a splendid run of mines, while on its northern slopes there is another great belt of copper lodes extending east and west in virgin ground from Three Castle Head to Ballydehob old mine, a distance of 25 miles, and also, I believe, the best mine of sulphate of barytes in the United Kingdom. With miles of valuable mines and mineral properties lying idle, it seems to me quite incomprehensible that British capitalists will invest and lose millions sterling in foreign schemes over which they have no control, whereas by investing moderate amounts of capital at home, and seeing and satisfying themselves that it was judiciously and honestly applied, they would have a certainty of realising handsome profits. F. G. S.

SILVER-LEAD, AND SOUTH DEVON SILVER MINES.

SIR,—In Mr. Robert Hunt's Mineral Statistics, published in the Supplement to the *Mining Journal* of Sept. 14, the quantity of silver in the 252 tons 17 cwts. produced from the lead in Devonshire in 1877 is given as 4948 ozs., or a percentage of 20 ozs. to the ton. This shows that the lead of Devonshire holds first rank in the lead produced in all the other English counties, as well as in Wales, Scotland, and Ireland. The Isle of Man is the only one superior in quantity; Cornwall holding the second place to Devonshire. In a former letter I referred very briefly to the silver found in the halvans at a lead mine in Devonshire. With your kind permission I will refer to the subject more in detail. It is a very important one, as it appears from the letter in the Supplement to last Saturday's Journal, signed "A Commercial," that the imports of silver last year was very largely in excess of the imports of 1876 and 1875. This shows the great importance of bringing into the market every available resource in our own country, and the all important question is can this be done as a profitable adventure. I will endeavour to show in one instance that it can. To prove the lead and silver in the halvans at the mine to which I have referred the following practical plan was adopted. Holes were dug at nine different places, and a box made of a definite size was filled from the bottom of each hole. The whole of the contents of nine boxes were mixed and reduced to a fine powder. A measured quantity of this was then assayed for lead and silver, giving the following result:—

Per cubic yard ..... Lead 1 32 cwt.
Ditto..... Silver 4·07 ozs.

The contents of the halvans being carefully measured were 23,600 cubic yards, or an estimated produce on the above mode of testing—

1557 tons 12 cwt. of lead.
96,052 ozs. of silver.

This percentage of silver is so much higher than that given by Mr. Hunt for Devonshire that the fairest way of estimating the value in the halvans would be to take the average for 1877. In addition to the halvans there is in the mine a lode 50 fms. high and 40 fms. in length, or 2000 square fathoms. A very experienced silver-lead miner estimates the lode to yield 2½ tons silver-lead per fathom, or 5000 tons of silver-lead in the lode. I will, however, reduce the figures, as follows:—

Lead in the halvans.....Tons	1500	
Ditto, in lode.....	3500	
Total	5000 at 8*l.* per ton...	£40,000
Silver in the halvans and lode at 20 ozs. to the ton —say, 100,000 ozs. at 4s.		20.000
Gross total		£60,000

As there are several other lodes in the mine I will leave them to stand against the cost of machinery requisite for raising and dressing the ore. Water for machinery is in abundance.

Bringing down the above total	£60,000
Cost of raising and dressing, (say) at 5*l.* per ton ...	25 000
Or, a clear profit of.....	£35,000
Allowing for contingencies	10,000
We have an ultimate profit of	£25.000

So that on the assumption that the mine could be purchased and adequate machinery put up for (say) 15,000*l.* the whole capital would not only be recouped but a sum adequate to pay a dividend of 50 per cent., carrying over 2500*l.* in cash, and the mine with its splendid virgin lodes and a plant worth 10,000*l.* The purchase money being 5000*l.* Now, here is an adventure worth attention. There is no mad speculation in such a mine, but a sound legitimate field for the expenditure of capital. These halvans are like the field with hidden treasure. The lead and silver are there to a certainty, and fortunate will those capitalists be who take up with this mine.

Dark as things are there is a silver lining in the cloud now hanging over us. Lord Beaconsfield, the advocate of imperialism, the man who despises the will of the people (which if the highest law), has been caught in a trap. Depend upon it there are serious dissensions in the Cabinet sprung out of Eastern and Afghanistan difficulties. No wonder; there is such a thing as conscience, however much men may swear by the party. The Ameer, who in all probability never studied Lord Chesterfield's advice to his son, and knows most likely nothing of the polite usages of society, and may be guilty of that fearful high treason of eating his dinner with a knife, refused to take off his hat to the Tories. He didn't care to be pestered with Lord Beaconsfield and his representatives; in that he showed good taste, he said "I shan't." "Cut off his head," is the Christian response of the Premier. England is committed to a war eminently fitted to be popular in the regions of Pandemonium. Parliament is to meet. Beaconsfield must explain the why and the wherefore. Cabinet dissensions will come to the front. Parliament will be dissolved, and the great Conservative party—as was the case when Peel abolished the corn laws—will be scattered, as I heard Cobden express it, to the four winds of heaven. Gladstone will so unravel the miserable policy of Lord Beaconsfield and his blind supporters as will culminate in the Tories being everywhere received with—

One universal hiss of public scorn.

The country must, and I believe will, return to Parliament a majority of Liberals pledged to a retrogressive policy. Mr. Gladstone must be asked to lead that majority to the adoption of such measures as will rescue England from the disgrace into which it has been thrown by the imperialistic policy of a politically bad minister, and a convenient set of ministers and blind followers, and inaugurate a new and bright era. Trade will revive, commerce will revive, distress will fly away, and we shall see under a Gladstone administration bright, happy, and peaceful times; and England made wise by adversity will, under the blessings of Providence, rise to a higher degree of prosperity than ever. We shall have a restoration of confidence, and mining and other great staple industries will rise up and become the means of untold blessings to the working classes.

Ulverston, Nov. 26. F. G. S.

RECIPROCAL FREE TRADE.

SIR,—That the absurdity of unrestricted free trade has become but too evident from the 25 years' experience which England has had of the working of the Manchester system must, as was stated in last week's Journal, be acknowledged: but the great question is how to devise a remedy? Liberalism and the Manchester School of political economists gave us free trade, which admit edly has "well-nigh ruined the commercial interests of this country;" but free trade is a system which, once adopted, can never be thrown off. To attempt to reimpose protective duties would now be impracticable and suicidal, but it is a great question whether protection, if it were returned to, would now give any relief. As to reciprocity, it would no doubt be productive of advantage to us under one condition—that it is universal. Reciprocity treaties with half-a-dozen countries, whilst all other nations were working independently of them, would produce evil rather than good. The fact must not be lost sight of that Great Britain has a larger population in proportion to her surface area than any other country except China and the valley of the Ganges, whilst the denizens of the temperate zone requiring more food than those nearer the equator, the British are really dependent on an outside food supply if prices of general merchandise are to be kept down to a price that will enable us to do any business with foreign markets; a "cheap loaf" and cheap necessaries of life are indispensable, so that the free importation of foodstuff is a necessity.

The country has ample resources in raw materials and in manufacturing appliances, and producers and manufacturers must do their best to adapt themselves to the altered state of things. Sometimes the advocates of reciprocity and protection do far more in favour of free trade than they intend. Mr. W. C. Alexander, of Slingsby, for example, in answering a Free Trade article in the Leeds Mercury, refers to the Irishman and the eggs, and says that the story epitomises what free trade has done for England. There are plenty of eggs (of foreign production), but no shillings to buy them; and in consequence of the British poultry yard being destroyed, in the event of a great European war we should have neither eggs nor shillings. It is unnecessary to say that his fear is undoubtedly groundless; and he concludes by saying that "in fighting hostile tariffs with free imports we are combating antagonists who hold loaded dice, against which the china-clay-weighted calicoes of free trade Lancashire are of no avail." Here Mr Alexander brings prominently forward the real cause of England's commercial decline. Formerly the foreign customers of Great Britain were content to pay a fair price for English manufactures, because an English maker's name was a guarantee for good quality; now English manufacturers send but little out of the country except "china clay-weighted calicoes," rails made of cinder pig or any other rubbish that will just hold together long enough for the bill paid in purchase of it to be honoured—though even this degree of durability was not secured in the recent shipment to Australia—and it is the same with almost every article of which the export returns of Great Britain are made up.

In his lively opposition to free trade, Mr. E. S. Cayley, of Wydale, states that we have been idiots enough to admit foreigners to sell their goods in our markets without making them pay for the building and repairs of the market-houses. I am speaking of articles which compete with those of home produce, not of tea, coffee, or cocculus Indicus. We pay altogether some hundred millions per year in rates and taxes. Of course that hundred millions adds at least a hundred millions to the cost of the entire produce of the United Kingdom. Suppose, for instance, that the entire produce turned out for sale is equal to 10 or to 20 times that amount, then, in common justice to our own working people, there ought to be a 10 or a 5 per cent. duty respectively on all imports competing with our own, whether iron, cotton, sugar, corn, beef, or bombazine. We have gone upon an opposite tack, and from some unaccountable freak have been pleased to call it "free" trade, but it is not in any sense "free," except that we have made ourselves fast, though we have made the foreigner free of our market. All the burden is ours, all the freedom is somebody else's. But Mr. Cayley is here no more accurate than Mr. Alexander. Free importation has given us an abundance of cheap foodstuff, whilst had there been no repeal of the Corn Laws bread would at present have been at 1s. per lb., even if with the constantly increasing population the growth within the British Isles of sufficient foodstuff to feed the people had continued possible.

There is nothing like taking an example, as has, indeed, already been done by a competent writer in combatting the reciprocity theory, the advocate of which says—"Free trade with those who will meet us on equal terms; protective duties upon all the articles of other countries equal to those imposed upon ours. This is the remedy, and none other will work." Let us see how this would operate in the case of the United States of America. Our two great articles of import from that country are cotton and corn, and because they put heavy duties upon our manufactured goods we are to retaliate by putting heavy duties on them. Our great difficulty now is to meet competition in foreign neutral markets. How would it help us to do this by putting a heavy duty on American cotton, thus increasing its price and the cost of our manufactured goods? How would this help us to compete with other manufacturing countries, and especially with America with her untaxed cotton? To enable us to compete with the world we want cotton as cheap as we can get it, and as much of it. To tax American cotton would be to play the game of the American cotton manufacturers. But by taxing American cotton and corn we should compel them to come to reasonable terms. Not at all. Other countries would buy and manufacture their cotton if we would not, and the American cotton manufacturers would be placed at such an advantage that we should have no chance of competing with them either in their own or other countries. The policy would be simply suicidal on our part. The same remarks apply to Russia. They impose heavy duties on our manufactured goods. Shall we retaliate by imposing heavy duties on their flax, hemp, corn, and tallow? On the contrary, we want as large and cheap a supply as possible of the raw materials of our manufactures, and whatever tax we put on them will increase their price and add to the cost of the manufactured article, and I cannot see how this increasing the cost of our goods will help us to sell them, in competition with our rivals, in the markets of the world.

It is this inability to understand the necessity of raw material in a manufacturing country like England that has led Mr. Peter Watson into the grievous error which he is credited with in last week's *Mining Journal*, and which he would not have fallen into if he had had the smallest acquaintance with the most rudimentary elements of political economy. He is quite correct in stating that a few years since copper fetched 150*l.* to 170*l.* per ton, and tin 150*l.* to 155*l.*, whilst at present both are at about 55*l.* to 60*l.* per ton, but he seems to be unable to comprehend that this is not the result of free importation but of bona fide free trade—not the result of letting foreigners send their raw material to Swansea but by free trade being availed of by our manufacturers to enable them to place the best British machinery at the mines of Chili, Africa, the East Indies, Spain, and wherever else copper, tin, or lead deposits can be found. Now one would have thought even Mr. Peter Watson would be able to see that by the free importation to which he objects this country at least secures the profits of manufacture, whilst if we excluded the ores we should drive the producers to turn their minerals into marketable metal, which would be sold in the markets we now supply. Even the 4*l.* duty on lead levied at New York, about which Mr. Peter Watson is so melancholy, is no disadvantage to this country, for if the duty were removed the American would be driven to make and sell pig-lead (as they readily could do) at 4*l.* or 5*l.* per ton cheaper than at present, and would shut British lead out of many markets, as they are now doing out of China and Japan. Perhaps Mr. Watson will state how many tons of American pig-lead reaches this country annually. He asks—why should we pay 4*l.* per ton duty at New York whilst Americans and other nations deliver their lead here free? The Americans do not supply the British market with lead, and the Spanish lead sent into this country is all made by English companies, Englishmen receiving the whole of the profits realised.

But the British mining districts need not yet be abandoned as worthless if they be managed with the same amount of skill as is displayed in the foreign mines. At present there is scarcely a mine captain in England who has received any sytematic education to qualify him for his position; they are good hard-working men, but very illiterate, and thus it is that in Cornwall, in Wales, and elsewhere in this country so many mines are incompetently worked; whilst abroad, when the Cornishman is working under an intelligent and educated superintendent, he is the best manager that can be found. Mr. Peter Watson and his friends may take it for granted that there will be very little permanent rise in either tin, copper, or lead for some years to come, whether free trade continue or protection be reverted to; and, if we are to have profits, we must have more highly educated mine captains, a better duty must be got out of the engines, and greater care must be taken to see that the miners perform a larger quantity of work in a given time, though there is no reason why they should not earn 25 per cent. more money if they perform 25 per cent more work. Let us look the present position fairly in the face, and act accordingly, and there will be no cause for complaint.—*York, Nov.* 28. T. SMITH,

RECIPROCAL FREE TRADE.

SIR,—I read with much interest your very excellent leading article on this most important question, as affecting more especially our mineral produce of this country. The quotation you give from the remarks made by Mr. Peter Watson on the subject clearly shows the suffering brought on in Cornwall and Devon mining interests through the very serious depression in the prices of copper, tin, and lead. Something must be done, and that quickly, to protect the metal and mineral producers of this country. I shall refer to this matter in a week or two. RECIPROCITY.

London, Nov. 27

DEVON GREAT CONSOLS.

SIR,—During the depression in mining, which unfortunately has been of such long continuance, reports with regard to the affairs of the above mines have been so conflicting, and the differences with the men have been so deplorable, that I venture to solicit the favour of being permitted through the medium of the *Mining Journal*, to make a few pointed comments thereon. For some reason which it is difficult to comprehend reports have been constantly promulgated through the medium of the Press giving full prominence to the working expenses of these mines, but at the same time concealing a most important portion of the earnings which have been the means of placing the Devon Consols Company in the position of being the largest manufacturers of arsenic in the world. When it is considered that this valuable adjunct to the property of the company exceeds in bulk and value the total returns of many productive mines in the kingdom, its importance will at once become apparent, and the concealment of its existence will be all the more surprising.

Throughout the wretched conflict with the men some little while ago it was persistently represented that the mines were being worked at an enormous loss, and that, therefore, the wages must be cut down; when it was all the while as clear as the sun at noonday to every man in the mines and in the district, who witnessed the huge mass of this valuable manufactured article stored and held in reserve, that calculated at the ordinary marketable price the mines were actually working at a good profit. These are facts that cannot be controverted, and the time has come when the district shareholders and the mining public generally should be made aware of the startling truth.

A full and explicit statement of the real position of the mines will, it is hoped, be called for at the meeting on the 28th inst. It is of the utmost importance that this should be done.

Nov. 27. A MINE ADVENTURER.

MINING IN NORTH CARDIGANSHIRE.

SIR,—Having heard of a very fine discovery of lead ore at Carndwrmawr, I went up last week to see it, and found that it was all I had been told and more, the ore being not only of a great width out of the finest quality it has been my privilege to see in this county—in fact, there is everything to indicate that a great mining industry is likely to be created in this somewhat remote district, especially as this splendid lode in going further east forms a junction with several other lodes, and at that point it appears from shallow workings there is a lode some 20 fathoms wide, filled with (at surface) a most splendid and promising gossan. I wish the proprietors, whoever they may be, every success. J. D.

Nov. 27.

PARYS MOUNTAIN MINE.

SIR,—I am glad to see that there is at last a chance of the spirited and persevering adventurers in this grand old bal being rewarded for their patience and outlay. The intersection of the flookan in the 90 cross-cut south, the said flookan producing good stones of ore, is probably the forerunner of a grand discovery of copper ore. In the economy of mining flookans have always played an important part, and I hope and believe Parys Mountain will be no exception to the rule, but that the long sought for riches will be found close to or not far off the flookan discovered in the 90 cross-cut south.

Tavistock, Nov. 29. JOHN MILTON.

PARYS MOUNTAIN.

SIR,—Some years ago when in Chili a gentleman, the proprietor of silver mines, said to me, "At my mine, San Ambrosio, they have for the last two or three years been driving a cross-cut to intersect a lode; they seem to be a long time finding it. I wish you would go and just see what they are about." I did so, and found that they had driven, and were still driving, through a flinty rock a length of 80 yards their so-called cross-cut, but directly *parallel* with the lode of which they were in pursuit, so that had they driven to the Antipodes, supposing that both lode and cross-cut held their then direction, contact would have been impossible; and were not the mining operations at Parys Mountain conducted by a Cornish miner, might it not be thought possible that a somewhat similar phenomenon might there be found? Upwards of three years ago I was forcibly persuaded to purchase shares in this mine, it being held out as the plausible reason why I should do so that they were on the immediate eve of cutting by a cross-cut at the 90 a lode in virgin ground, from which almost unparalleled wealth had been extracted from an immense chasm on its back, and so on. During the period

named the public have from time to time—more particularly in the early part of it—been informed through the medium of your Journal, that, in said cross-cut, this, that, and the other promising and encouraging signs had appeared, that branches of copper ore had been cut and gone through, that an increase of water had appeared, disappeared, and appeared again—all indications of the near approach to a lode, but no lode has, as yet, been found. Then, where is it? Can anyone solve the problem? Surely it is time that it should be solved. Hitherto the world is said to have but seven wonders, but may not the Parys Mountain mystery be added as the eight. JOHN LEAN.

King's-square, Goswell-road, Nov. 26.

Meetings of Public Companies.

OREGON HYDRAULIC GOLD MINES.

The annual general meeting of shareholders was held at the offices of the company, Austinfriars, on Tuesday,

Mr. COURTENAY in the chair.

Mr. W. J. LAVINGTON (the secretary) read the notice convening the meeting. The directors' report and the accounts were taken as read.

The CHAIRMAN said: Gentlemen, I do not intend to detain you long to-day, as the operations of the company for the past year can be briefly stated. We have had a good supply of water, but the yield of gold from the gravel has been most disappointing. Washing commenced on the Reed claim where we stopped last season, and on the Thoss claim at a point where it was considered that good results would be likely to be obtained, but on both claims the yield was less than in the previous year. I cannot give you any satisfactory theory to account for this falling off in the yield of gold, but it is manifest that in both claims, and especially in the Thoss claim, the gravel varies in value exceedingly, so much so that in this latter claim—I mean the Thoss claim—you can scarcely rely upon the yield of gravel for (say) 50 feet from where you may happen to be working at the time. I described the gravel last year as being "spotted" in character, and I am sorry that the experience of last year's working has shown it to be even more so than I thought it to be; but at the same time we must notice that just because of this uncertainty in the yield of gold it is quite possible that at any moment we may come upon better gravel, as rich as it was the first year that we worked the property. With a view of finding out what kind of gravel there was ahead of our workings in the Thoss claim a good deal of prospecting has been done by our agent, Mr. Ennis, during last summer. His report, which was sent to you on September 25 last, having been sent from the mines in the preceding month of August, gives a full account of those explorations, and also details of the plan upon which he purposes working during the coming season. I need not here recapitulate that report, but it is satisfactory to know that the drift was run on the Thoss gravel by the superintendent, Mr. Thorndike, for a distance of about 120 ft., with an average depth above bedrock of 14 ft., when they were compelled by the water to stop. Gold was found the entire length of the drift, but it is curious to note that no gold was found on the bottom—the particular point where they happened to strike the bottom; but you will understand that where they stopped working because of the water they were not able to reach the bed-rock, so that we do not know what gold there may be on the bed-rock at the point where the drift was stopped. The gold prospects I am glad to say were sufficiently encouraging to induce Mr. Ennis to determine to begin washing again at this point, and he writes me (founding, of course, his opinion upon these recent tests) that he thinks the washing of gravel at this point will pay after the first month's washing. We shall continue to work the Reed claim this season, for no further outlay on the tunnel is required. I must now call your attention to another portion of Mr. Ennis's report which I am able to state is of a very encouraging character. You will notice in the third paragraph of his report the favourable opinion he has of another portion of the property, distant about ½ mile from the Thoss claim, upon what is known as the "Applegate" gulch. Mr. Ennis advised the fitting up of this claim, and we would have fitted it up at once had we spare funds; but I am extremely desirous not to incur further liability of any kind until we have seen the result of the coming season's work. Mr. Ennis has managed the affairs of the company in Oregon with his usual skill and economy, and it is only right that the shareholders should know that he has made no charge for his services. The balance-sheet has been sent to all the shareholders, and I do not intend to offer any further observations at present. Our director, Mr. Bowe, who was prevented by illness from being present at our last annual meeting, desires to offer some remarks, and I will, therefore, call upon him to second the motion which I now move—"That the statement of accounts as circulated be received and adopted."

Mr. BOWE said: I will second the resolution, gentlemen, and say that severe illness having prevented me from attending your last annual meeting, I feel it incumbent, in view of the unsatisfactory results of the past year, that I should make so me remarks thereon. Considering the prospects, as evidenced by my experimental washings in the spring of 1876, as also the washing done by Mr. Ennis in 1877, it is almost unaccountable that the results of this year's operations should have been so small. You will recollect that the results for the very small amount of washing which I was enabled to do before I left Oregon in 1876 was most satisfactory, having taken out before my departure on June 20, $7450, which amount was supplemented by $2800 more, as reported by Mr. Ennis on July 20 following, making a total of $10,250 for less than two months' desultory washing. The last ten days' washing on the Reed claim for that year yielded $1700, which is equal to 43 cents per inch for the water used, and the last seven days' washing on the Thoss claim previous to my departure, using only 350 in. of water, yielded $1338, which is equal to 54 cents per inch of water. It was these results, coupled with what I had ascertained as having been taken out of the property by former owners, which led me to the conclusions expressed in my letter to the directors on January 16, 1877. The washing done by Mr. Ennis, in 1877, although not so satisfactory as that of the year before, was much better than for the past year. In consequence of the extreme drought that year he was not able to wash more than two months, but that two months gave a yield of something like $11,500, which was equal to 20 cents per inch of water used. Our water supply for the first year was nearly or quite up to the expected average, and if the gravel had continued as rich as it was the year I left the mine we should have taken out over $48,000, or if it had yielded as much per inch as it did in 1877 the produce would have been $22,000, instead of which it is, as you see, only $10,580. This could be accounted for by the fact that the gold is unequally distributed in the gravel—a circumstance which no one could have foreseen or known without the extensive washing tests we have made. The results of the pan prospecting done by Mr. Powers, Mr Ennis, and myself, before the property was taken over, as also the results of the first year's desultory washing, could lead to no other conclusion than that this gravel deposit would prove to be not dissimilar to that of the ancient river-channels of California, which, where the facilities for development are favourable, and with free water as we have here, have scarcely ever failed to pay a good profit on the working. The appearance of the property from the time of my first examination of it to that of my departure was most encouraging. Had it not been so I should never have jeopardised my health as I did by pushing the work so completed right through one of the most stormy and disagreeable winters which had occurred since the first settlement of the State. In remuneration for services rendered to the company (which occupied my undivided care for a twelvemonth) you were kind enough at last annual meeting to vote me the sum of 800*l.*; no part of which sum have I yet received, nor shall I at any time demand or accept any portion of it until the shareholders have received a substantial amount in dividends, which I still have hopes they will do, for it would be a coincidence at variance with all former experience if this gravel channel, which it is now pretty well demonstrated extends through the whole property, should prove to have been rich only at the points where it has been washed away by Rich, Applegate, and Blanchard gulches. These gulches, as well as Gallice creek, into which the two latter empty, were all very rich, and the gold found in their channels or beds could have come from no other conceivable source than this gravel channel, as it is a fact that the beds of these gulches paid rich up to the very point where this gravel channel crosses them; but no gold was found in them above this point. As there is a very large area of this channel yet unwashed, I think we may reasonably expect that we shall yet open up extensive portions of it, which should at least pay as well as it did in 1877. In the reasonableness of this opinion we are supported by Mr. Ennis, in whose judgment as a hydraulic miner and straightforward business man, I have always had the fullest confidence. Under date of September 22 last he writes me as follows:—"I have just received a letter from Mr. Thorndike, saying the Thoss drift was in 120 feet, and had sunk down 14 ft. at the end of it, without finding any bed rock, water coming in too fast to sink deeper; found gold, average one colour to two pans. This prospect of itself would, in my opinion, be enough to justify working another season on this claim, and I shall prepare the claim for working as fast as possible. I am also in favour of opening another claim on Applegate gulch. There will be considerable water wasted unless there is a third claim to use it while blasting rock cuts in Reed and Thoss. I think the new claim would have water as much of the time as could be used to advantage; another thing, the ground has to be prospected some time, and it is better to do it while we have the Reed claim to keep up expenses. I do not wish to inspire false hopes, but I have more confidence in the property than I have had since the first water season. The drift at Thoss convinces me that the channel does go through all the flats between the Thoss and Reed, and when fairly at work on them will, I think, pay as well as the Reed, and that will enable us to send money to England at a rate that will in a few years pay the shareholders back their investment. I may be over sanguine, but hope not. Will keep the sluices close up to bank in the Reed this winter, and we ought to do well there, and can if we have a fair water season, and the claim is energetically worked." That is, I think, the most satisfactory opinion that Mr. Ennis has expressed since the year I left there.

Mr. KEIR asked what was the amount of cash in hand which the company had?

The CHAIRMAN replied that it was 50*l.* 17*s.* 1*d.* For nearly two years no money had been sent to Oregon, and there would be no further expenditure on capital account, unless it should be determined to start a third claim. The directors thought it better to see what the two claims at present being worked would yield this season before making any further outlay. The loss incurred during the past year had been 211*l.* 5*s.* 11*d.* The cost of permanent improvement had not been increased, the whole of the expense under that head having been paid out of revenue.

Mr. KEIR asked if the directors were of opinion after the experience of the past two years that a third claim was desirable?——The CHAIRMAN in reply said it did not follow that because the gravel was poor in one portion of the property it would be in another; nothing but actual experience could prove that. In any case the starting of a third claim would not involve a larger outlay than 200*l.*

Mr. KEIR said it appeared from the accounts that the property had cost the company a large sum in cash and shares, and after working for two years the net result was a loss, and not a profit, on the working.

The SECRETARY remarked that the net result of the working in Oregon was a profit of 590*l.*

Mr. KEIR wished also to include the expenses on this side. No doubt the shareholders were disappointed with the results, and they would be very doubtful of any future estimates. He would deprecate any further expenditure on opening up claims, for he considered that too much money had already been spent. He would also ask whether the expenditure on this side could not possibly be reduced? The sum of 2167*l.* seemed rather a large item for expenses in London.

The CHAIRMAN said that was the whole of the expenditure in London since the commencement of the company. During the past year the London expenses were only 184*l.* It would be seen by the accounts that no directors' fees had been charged.

Mr. KEIR considered the expenses very moderate under the circumstances.

Mr. BOWE said that, including the amount paid for the United States patent, the property had only cost the company about 2000*l.*, and every other dollar had been spent in the development of the property. They had had to make nearly twelve miles of ditches, and run long tunnels. It would be very impolitic to think of abandoning the property because it did not pay one year. If such a course had been adopted in the case of the Consolidated Virginia and other similar mines, those valuable properties would never have been discovered. They had two miles of gravel deposit unexplored, except where the ravines crossed it. He would also mention that in nearly all hydraulic mines the companies are in debt to those who supply them with stores during the latter part of the season, but with the return of the water season their debts were liquidated.

The CHAIRMAN said it was not a fact that a large sum of money had been spent on the property, for the amount was in reality very small, the purchase money having been paid chiefly in deferred shares, upon which nothing would be paid until the shareholders got back their money. The actual amount of cash paid was about 1600*l.*, the property obtained from the United States at so much per acre having increased that amount to about 2000*l.* Granting that the property was worth anything at all, he thought there had seldom been a company which had obtained such favourable terms. He did not think any company in London was worked more economically than their's was.

Mr. COBB advocated the continuance of operations.

The accounts were then unanimously adopted.

The retiring directors and auditors having been re-elected,

The CHAIRMAN proposed a cordial vote of thanks to Mr. F. Ennis, the agent, and Mr. Thorndike, the mining superintendent, for their careful management of the company's affairs during the past year. Both gentlemen had exerted themselves on behalf of the company in a very satisfactory manner, and while the mine was not yielding profits to the shareholders Mr. Ennis was giving his services gratuitously.

Mr. COBB seconded the proposition, which was carried. The meeting then terminated.

DEVON GREAT CONSOLS COMPANY.

The ordinary half-yearly meeting of shareholders was held at the offices of the company, Gresham House, on Thursday,

Mr. PETER WATSON in the chair.

Mr. A. ALLEN (the secretary) read the notice calling the meeting.

The directors' report, the manager's report, and the accounts were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said he had again to regret that the report of the directors was not more favourable, and also the report of the agents, and the accounts; but they were all aware of the great depreciation in the price of copper, which had now continued for the last 10 or 12 years, which, of course, was a serious thing for all interested in copper property in this country. In 1847 the price of copper ore was 6*l.* 15*s.* per ton; in 1857, 6*l.* per ton; in 1867, 5*l.* per ton; in 1877, 3*l.* 10*s.*; in the corresponding half of last year the price was 3*l.* 6*s.* per ton, whereas it was now 1*l.* 18*s.* 6*d.* per ton, which, on 4000 tons of ore, was a serious difference. The difference between the corresponding half-year—April 30 and Oct. 31, 1877—and the same period in 1878 showed a falling off of 1*l.* 7*s.* 6*d.* per ton, which, on 3953 tons, made a difference of 5400*l.*—that was to say, that had they received the same price in 1878 as in 1877 there would have been a much more favourable profit and loss account. But such was the depreciation in the value of copper, and of other metals, and of trade in general, that it was a very serious question for the shareholders to-day to consider with regard to the enormous expenditure which was going on at the mine, and the returns as against that expenditure. He could only say that the board had done all they could in urging and insisting on a reduction of costs, and in keeping them down as much as possible. If they contrasted the cost in the past half-year with those of the previous half, they would find a very considerable difference. The expenditure had been 16,200*l.*, and the sales of minerals 11,412*l.*, showing a difference of about 5000*l.*; but in reality they must not put it down as a loss, but it was simply receipts and expenditure. This was only a bi-yearly account, the annual meeting being always held in May, when they would have full and more detailed accounts; but these figures represented, as he had said, the actual receipts and expenditure for the half year. Had they sold more copper ore and arsenic, and delivered it, the directors would have had a better state of accounts to produce to-day. He went on to refer to the arsenic contract which was entered into about ten months ago, which had been only partially fulfilled, and the directors had sold the arsenic out against the contractor, and taken credit in the accounts for the amount received. In the report it was stated, "Your directors hope and believe, with an early revival of trade, the present stock of arsenic on hand will be disposed of more readily." As regarded the present stock of arsenic, many people ran away with the idea that the directors would be obliged to sell that stock in order to avoid a call of 1*l.* per share; but the persons who thought this had made a mistake. The directors had kept aloof from pushing the sale of the arsenic, believing that, with a revival of trade, a better price would be obtained. Instead of forcing the sales of arsenic at the time, the directors obtained a loan to the extent of 7000*l.* from the bankers, 1000*l.* of which had been paid off at the time the accounts were made up, and he hoped the shareholders would give the board credit for having by this means avoided the making of a heavy call of 1*l.* per share. The directors at the time of making the loan had reason to hope that, with a revival of trade, they would be able to sell the arsenic, and recoup the 6000*l.*, and he was very pleased, indeed, to day to be able to tell them that that arsenic had very recently been sold, and the 6000*l.* would be wiped off, and the shareholders would not be called upon for 1*l.* per share as some people anticipated. (Cheers.)

A SHAREHOLDER: At what price did we sell it?——The CHAIRMAN said it would scarcely be wise to name the price in public, but he should be happy to mention it privately to any shareholder. He would only say that it was a satisfactory price, and was sold to a most satisfactory firm, and he would be almost willing himself to guarantee the payment of the account—it was a gentleman whom he had himself known for many years. The report went on to say, "In the last half year's report it was stated that the expenditure at the mine had been reduced, and in the opinion of the directors a further reduction would have to be made in order to cope with their stagnation. Accordingly reductions have since then been made." The shareholders were aware that some time since he went down to the mine and settled all matters amicably, and there was a considerable reduction of expense effected, but the directors believed that a still further reduction could be effected in the development of the mine, and it was under the consideration of the directors how best to effect this object. It was of vital importance that they should endeavour to do all they could to make both ends meet, and if they could not make a large amount of profit in the present depressed time that at any rate they should all pull together for the welfare of the company, and keep it on its legs till better times arrived. (Cheers.) Mention was made in the report of the shutting up of foreign mines; it was a fact that in Australia they were shutting up old mines which had been selling ore of a quality six times better than this company's ore, therefore the shareholders could well understand the struggle which the board had had to keep this company in its present position. (Hear, hear.) He knew that it was of vital importance to many shareholders to obtain a return from this property, because of course the depression of trade affected everyone. As regarded the question of the dues, a communication from the board was recently sent to the Duke of Bedford on that point, and to-day a letter had been received from the duke's agent, Mr. Martin, acknowledging the receipt of the communication. The directors hoped that his grace would take the question into his favourable consideration, and give the company a helping hand at the present time, not only with respect to concessions in connection with many unproductive points which according to the agreement they were bound to develope but also with respect to the dues. A helping hand was being given by the lords in Cornwall and other places, and also by the owners in the coal and iron districts, and he was sure this was a judicious step, because it stimulated the shareholders of such companies to continue working. (Cheers.) They had decreased their reserves of ore 5278 tons, which showed the poverty of the mine, and the importance of the duke coming forward and giving a helping hand. (Hear, hear.) He might mention that the reserves of arsenical mundic had increased by 580 tons. As long as he had anything to do with the concern he would do his utmost to promote the best interests of the company, and he could not do better than repeat the closing paragraph of the report—"In the present state of havoc and depreciation in the values of produce and property generally throughout the length and breadth of the land, with its commercial convulsions almost paralising every energy, the shareholders will believe the board of directors when they mention their great and continued anxiety to serve the company faithfully and energetically, without fear or favour to any in discharging those duties which shareholders have a right to expect at the hands of managers and directors." (Hear, hear.) He could only again reiterate that the board were doing their utmost in the interest of the company. In conclusion, the Chairman formally moved that the report of the directors be adopted, and that the agent's report and accounts be passed.

Mr. THOMAS MORRIS (resident director) seconded the resolution, and said he was satisfied that the accounts for the present six months would show better results.

Mr. STEWART considered the accounts gloomy. He had called upon the secretary a few days previously, who with great courtesy gave him every information he wanted. As an investor in the company, he went through the accounts, and he was somewhat staggered at the large amount of expenditure, and he considered it was of the greatest importance to the company that there should no longer be a continuance of such large expenditure. (Cheers.) Having referred to the amount paid to the directors and one or two other points, he suggested, in no hostile spirit, that a consultative committee be formed, who could meet and discuss with the directors in a friendly spirit the possibility of reducing the expenses. (Hear.) He said he should like to know the result of the last two months' working, and whether the sale of stuff had produced a profit or loss. He referred to the fact that bread was now 40 per cent. cheaper, and some other things in proportion, and he suggested whether a reduction could not be made in wages. He moved "That in the opinion of this meeting a consultative committee of three members, with power to increase to five members, should be forthwith formed, to take into consideration the present enormous expense compared with the business done, and to reduce the same at least one half, if, after inspection, such be found expedient."——Mr. HORNCASTLE seconded the resolution.

Mr. HEADING said he did not think the shareholders could complain that the directors had omitted anything from the report which the shareholders had a right to know, but if he did not live near the mines and know something about them he would have thought that theirs was a bankrupt and rotten concern, and that it was not even worth the price which the shares were now selling for, which was certainly low enough. He was not a mining speculator, and he had never sold one of his shares, and he hoped to be able to point out things to the shareholders which would give them a more favourable impression of the prospects of the mine than they would have had from the directors' report. The shareholders had a right to hear the truth, the whole truth, and nothing but the truth. They had heard the truth, but not the whole truth. In the accounts all the expenses of extracting the arsenic where charged, while no credit was taken for the arsenic made. Was it a proper state of things that the directors should come and tell the shareholders that so much money had been lost? He could tell them that instead of making a loss they had made a profit, and the directors must have known that when their report was written. Theirs was as much an arsenic mine as it was a copper mine. Both the one and the other were raised together, and if the copper ore were sold as it was raised with the arsenic in it they would not realise so much for it as if the ore were sold after the arsenic had been extracted. Well, the cost of extracting the arsenic had been charged, while no credit had been taken for the arsenic produced. (Interruption.)

The CHAIRMAN wished to remark most emphatically that the shareholders had not only had the truth told them, but they had had the whole truth and nothing but the truth. (Cheers.) The accounts presented were made up upon the form which was always adopted. They were simply a bi-annual statement of receipts and expenditure, and if any of the arsenic had been sold before the accounts closed—which had since been disposed of—the statement would be so much the better. Besides this, the directors in their report stated that, "Knowing the feelings of some of the largest shareholders, whose interest in the company had cost them a heavy outlay, likewise their dislike to a call being made on them, the board of directors had thought it advisable to borrow a further amount during the last six months of 4000*l.*, making, with the sum previously borrowed, in all on loan account 7300*l.* By the recent sales of arsenic, however, this has been reduced to 6000*l.*, and as this produce is disposed of your directors hope to be enabled to pay off this amount." He had also told the shareholders that the arsenic had been sold, and it had been given credit for, and the loan would be extinguished. (Hear, hear.) What more could he say?

Mr. HEADING wished to refer to the arsenic contract made at the beginning of the year. He had asked the directors to close the contract when the first default was made.——The CHAIRMAN: The directors have done their best for the company. (Cheers.)

Mr. HEADING said the directors were bound to sell out at once, and not leave the company with all its stock of arsenic, upon which they had had to borrow money, by which they had sustained a loss.

The CHAIRMAN denied that any loss had been sustained on this account, and said they had got a better price for their arsenic than anybody else had obtained during the past 12 months. (Cheers.) The contract entered into by the directors was at pounds a ton better than the price at first offered, but the contract not having been fulfilled the company had sold the arsenic at the market price of the day. They had got the tip top price, and their average sales were as good as any in the market. By adopting the course they had the directors had saved the company thousands of pounds. (Hear, hear.)

Mr. HEADING asked why the directors did not close the contract when they found they had made a mistake?——The CHAIRMAN replied that the arsenic had been sold out against the people who contracted for it at the market price of the day, and the contracting firm was responsible for the difference. The directors had been advised to keep the thing in its proper form. (Hear, hear.)

Mr. ADAM JONES said Mr. Heading was evidently talking about what he did not understand. If he understood the arsenic trade he would not detain the meeting by making statements which had not the slightest foundation in fact. He (Mr. Jones) having a knowledge of the arsenic trade and general commercial affairs was quite prepared to support the Chairman. (Hear, hear.)

Mr. HEADING proceeding, expressed his belief that they had now seen the bottom of the depression. He thought that the directors had better sell the house which the late Captain James Richards occupied; and with respect to the work done on the mine, he thought the expenditure could be judiciously increased, for there were many points which he believed would pay for working. He thought the company would be less depreciated by making a call than by borrowing money—("No, no.")

Mr. STEWART: Nonsense; we are not a philanthropic society. The men are getting bread cheaper now than ever they have. (Hear, hear.)

The CHAIRMAN said he himself was the largest shareholder. When the money was required some time since he himself went to the bankers, and had obtained the means of staving off a call on behalf of the shareholders.

A SHAREHOLDER: We are very much obliged to you. (Cheers.)

The CHAIRMAN said that if they had not had the arsenic in stock the directors would have had to make a call, but the bankers expressed their willingness to advance against the arsenic, and thus the company was put in funds. As regarded the remark of Mr. Stewart that bread had gone down 40 per cent., that was the case. The miners in Devonshire were getting as good—indeed, better—wages than at many mines.

A SHAREHOLDER: Are they content?——The CHAIRMAN said the directors knew nothing to the contrary. As regarded the directors' 420*l.*, that amount was voted by the shareholders themselves in general meeting. He referred to the number of attendances of the different directors, and said that in addition to the 19 board meetings which he had attended, he had attended almost daily for two or three hours at the office. As he had said, the expenses had been reduced during the past six months, and the board were considering how they could by any means in their power still further reduce them. As regarded the resolution of Mr. Stewart, the directors had no objection whatever to it.

Mr. STEWART: I only want a committee to see into the expenses.

MIRZA PEER BUKSHSH thought that whilst the present low price of produce continued every effort should be made to keep down expenses. (Hear, hear.)

Mr. S. HARRIS, referring to the distribution of the directors' fees, said he did not know Mr. Morris, the resident director, but he was sorry to hear that a remark had been made with regard to that gentleman receiving 100*l.* as director.

Mr. HEADING: Our best men are leaving.

Mr. STEWART: And a good job if a good many more of them left.

The resolution for the adoption of the report and accounts was then put and carried unanimously.

The CHAIRMAN said the next business was to consider the resolution which Mr. Stewart had moved, and he would repeat that, as far as he was concerned, he had not the slightest objection to the appointment of a committee of consultation. Possibly it might do good, and give additional confidence to the shareholders. (Cheers.)

A SHAREHOLDER said he had known many committees appointed in connection with mining companies; he had never known one of those committees do any good, but he had known many do harm.

A short discussion ensued, some of the shareholders expressing their confidence in the board, and stating their opinion that a committee was unnecessary, while one or two others, whilst feeling confidence in the board, thought a committee of consultation might have a beneficial effect.

The CHAIRMAN said that he would read a paragraph from the report of the directors, which would show that the board were fully alive to the importance of economy: "Your directors are taking the present cost and returns under their serious consideration with a view to a further reduction in the expenditure, both at surface and underground, to alleviate the present deplorable depression, and by so doing keep this extensive run of mines and works from following the course of, unfortunately, numerous undertakings in this and other countries." He would repeat that the matter was receiving the most earnest and serious consideration of the board, and perhaps under these circumstances Mr. Stewart would adjourn his motion till next meeting to see what was the result of the directors' agents' exertions in that direction. (Hear, hear.)

Mr. STEWART, in compliance with the apparently almost general feeling of the

meeting, withdrew his motion.——On the motion of Mr. STEWART, a vote of thanks was passed to the Chairman and board of directors, and the meeting broke up.

FITZROY BESSEMER STEEL, HEMATITE IRON, AND COAL COMPANY.

The ordinary meeting of shareholders was held at the offices of the company on Tuesday,—Mr. THORN in the chair.

Mr. THOMAS WILLIAMS (the secretary) read the notice calling the meeting.

The CHAIRMAN said he had been asked to take the chair in the absence of Mr. M'Lagan, and he would endeavour to place before the shareholders the present position of the company. Since the last meeting the directors had had very great difficulties to contend with. One was that they had lost their Chairman, Lord Devon, which was a great loss to the company. Secondly, they were, almost immediately after the last meeting, requested by the Sydney committeee to take steps which his colleagues and himself thought would be very injurious to the company, and a great many letters passed to and fro. The Sydney committee sent word that they were very much pushed by the creditors over there, and unless the directors sent a large sum of money they would not be able to save the company. The directors immediately placed the matter in the hands of the company's solicitor, and it was decided to apply to the Court here to protect the company both in the interest of the debenture-holders and the shareholders, and he was happy to say the Court acceded to that request, and instead of appointing a liquidator, and entailing an immense expense upon the company, the property was placed under the Court in the hands of a receiver, which involved but a small expense, whilst at the same time it fully protected the property, and prevented anyone taking any action adverse to the whole body whether of debenture-holders or shareholders. A gentleman had been appointed in Sydney to act for the receiver here, and nothing could now be done as against the company without the permission of the Court, and, as a matter of fact, that nothing could be done for some time. The shareholders were well aware that nearly all the large iron and steel works in the country were not only making no profits, but in the majority of cases were being carried on at an immense loss; therefore, the position of this company was not peculiar in that respect, and if it could only go on till these matters righted themselves, which they must do (and he hoped and believed that they would before very long), the directors thought they would then be in a position to procure fresh capital for carry on the works of the company. There was no doubt whatever that the property was a very valuable one, and there were immense masses of solid and valuable iron ore. He went on to refer to the action of the board in sending out a manager and a man to work the iron. It was believed that they could make the iron at the price of 3*l.* per ton, and as iron was selling there at 4*l.* 10s. and 5*l.* per ton the directors thought that if they could get 4*l.* 10s. a ton they would make a large income. But, unfortunately, the furnace kept getting wrong, and would not work consecutively. It turned out splendid iron, but after working 100 tons or so the furnace had to be stopped, and this entailed a great loss, because the labourers had to be paid whilst the stoppage took place. The iron which was made fetched a very high price—about 1*l.* or 25s. a ton more than the best Scotch pig-iron ever sent out, but, owing to the furnace being so frequently out of order, it prevented the iron being made at a profit, and when the results of the twelve months were summed up it was found that the iron, instead of costing 3*l.* per ton, cost about 6*l.* per ton. It was then stopped by the Sydney committee, but he thought it was a pity the committee did not stop the work earlier, and apply the money sent over to the restarting of the mills and the reconstruction of the furnace. He went on to refer to the fact that there was a coal shaft, 223 ft. in depth, within a few steps of the works, from which could be obtained excellent coal, not only fit for the ironworks, but also suitable for the Sydney market, but this the Sydney committee had never touched, and although the directors had written to them about it no reply had been received. Having referred to one or two other matters of minor importance, he (the Chairman) formally moved the adoption of the report and accounts.——Mr. WITHERBY seconded the resolution.

A short discussion ensued, in which Mr. Wilson and one or two other gentlemen took part, and, in reply to Mr. WILSON, the CHAIRMAN explained that the board had no power to enforce the relinquishment of the B shares.

Mr. GREEN explained that his estimate of the cost of iron was based on data supplied by Mr. D. Smith.

Mr. HICKEY explained the position of the original B shareholders, and suggested that in the reconstruction of the company present holders who had paid for such B shares, should be entitled to some consideration.

Mr. GREEN suggested that only such iron as was in demand in the colony should be made, and that a large revenue would accrue to the company if they could turn out a sufficient quantity of small iron, as the quality of the iron far exceeded that of the best Scotch pig, and that a reconstruction of the company on a good basis would be very desirable.

Mr. WILSON proposed that the meeting be adjourned for six months, in consequence of the Sydney committee not having forwarded the necessary particulars of the accounts, or any vouchers for payments for 1877.——Mr. GREEN seconded the above, which was carried.

Mr. WILSON proposed a vote of thanks to the Chairman and directors, which was seconded by Mr. GREEN, and carried unanimously.

TYN-Y-FRON LEAD MINING COMPANY.

At an adjourned meeting of shareholders, held at the offices of the company, on Thursday (Mr. T. P. THOMAS in the chair), the notice of meeting and minutes of last meeting were read and approved. The statement of accounts and reports of the manager and Capt. A. Francis having been read, it was resolved that the accounts be received and passed, and that the same and the reports, with the resolutions passed at the meeting, be printed and forwarded to each shareholder. It was also resolved that Dr. Rowland be re-elected a director; that Mr. G. A. Symonds be re-appointed auditor; that Mr. T. P. Thomas be elected a director of the company; and that the thanks of the meeting be presented to him for his gratuitous services in the purchase of the machinery and management of the mine for the last 18 months.

Since the last general meeting our mining operations have been in enlarging the adit level, driving cross-cuts in various parts of the mine, clearing the stopes, timbering and proving the width of the lodes, and laying open the ore in the backs and bottom of the same for about 90 fms. in length. We have proved the north lode to be of great width, and for about 80 fms. producing leaders of blende, lead, and copper of various widths from 1 in. to 8 in., and in the north side of two of the stopes leaders of lead and blende mixed nearly 2 ft. In one stope we find a leader of steel ore about 2 in. wide, improving in length and thickness as it deepens. In a cross cut south in the eastern part of the mine we found a nice leader of Potter's lead ore about 8 in. wide; this leader can be seen for about 40 fms., and it has been worked by the ancient miners in several places up to surface, where it must have been very pure, as the coarser or mixed ore has been left standing; its being left is easily accounted for when we consider they had no means of crushing it. The winze sunk below this level appears to be in the centre of this deposit, and from information we have had from a miner who assisted to sink the winze the lead increases in value as it was proved in depth, and from the lumps of ore found in a heap that came from the winze by our agent we have further confirmation of its increasing richness. Beyond this ore ground the ancients appear to have lost the lode, and when I was underground with Capt. A. Francis, we considering it very advisable to find it previous to extending the level into the mountain, and we suggested a cross cut north, which has been extended 14 fms. without finding the lode; by extending this cross-cut about 12 or 14 fms further we shall intersect another lode seen at surface, but as that is not our present object we have suspended it, and commenced a cross-cut south, where we hope to find the Tyn-y-Fron north and south lodes. The south lode, which is about 3½ fms wide, is very similar in character to the north, producing good blende, lead, and copper, and approaches the north lode as it goes west. In order to prove it in the western end of the level a cross-cut south has been driven, where a rich course of blende about 8 in. wide has been found with a mixture of lead and copper, but the back above it being shallow, and the ground soft, we do not rely much upon it in the back, but from its richness in the bottom of the level, and its going down nearly perpendicular, while the north lode is underlying south, is a very important feature, as the two lodes must in a few fathoms sinking come together, and will no doubt make a mass of ore.

As I stated when I returned from Wales, I shall not pretend to estimate the produce of these lodes, but I believe we have in the backs an enormous body of ore ground that we can employ at least 30 men stoping for years without any further discovery east or west of the present ore ground. We have been unable to put more than four miners at a time to work, as the chief of the ground cut contains ore that has to be dressed. The floors at the mouth of the adit are full of ore, and until we can take it away to dress it is unadvisable to break more. Having given you a rough sketch of the underground operations and the laying open ore ground, I will now tell you what we have done at surface. First it was necessary to secure a supply of water to work the machinery for pumping, drawing, crushing, and dressing our ores; that I have done by purchasing the leat made by the Cae Gynon Company at a great cost, from the south side of the River Rhcidol across the said river to the north side, and on to our mine. This leat must must have cost some hundreds of pounds. We have not paid so much, but it is secured and paid for. The next object was to secure machinery; that I have done by purchasing two powerful water-wheels 25 ft. in diameter, 5 ft. breast, iron axles and rings, with cranes, launders, houses, pumping crank and bob, a powerful crusher with frame, tumbler shafts, double raff-wheels, &c., complete; set of patent jigs, jigging hutch, new, about 500 fms. of chain for drawing, blacksmith's bellows, anvil, tools, and 30*l.* We have not paid one-fourth of that sum, but it is bought, paid for, and in our possession.

The next object was to take this machinery down and erect it on our mine. In purchasing the machinery I secured the lessee's right in the Caegynon Mine, and to dress our ores on that mine, subject to our obtaining the lord's consent so to do, and as this would save us the cost of taking down, erecting, making wheel pits, floors, buildings, &c., and also enable us to commence dressing at once, we have been in treaty with the lord and others, but have not yet succeeded in securing the right, without payment of a considerable sum of money down and a rental, and then only for the lord's life, consequently we have determined to erect it on our own mine. This negociation has caused delay, which I regret, but had we succeeded the saving in time and money would have been great. Our progress will depend upon the weather, which we cannot expect to be very favourable for the next two months, but our agent will I am sure lose no time when the weather will allow the men to work. The accounts from the commencement of the mine to the end of October accompany this report, and I trust they will be satisfactory to you, and show you that mines can be worked economically as well as extravagantly. In conclusion, and as to the prospects of the mine, I have no hesitation in saying, as Capt. Absalom Francis said when he was underground with me, and expressed in a letter in the *Mining Journal* afterwards, I have seen no lode in Cardiganshire like it, excepting Frongoch. As soon as we can commence dressing, even at the present price of lead and blende, we shall be making good profits and dividends.

Nov. 23.—Agreeably with the request contained in your letter of the 21st inst., I have much pleasure in forwarding you the following report on the position and prospects of this property. Since you took possession in May, 1877, the adit cross-cut has been cut open and made fit to receive a permanent railway from surface to the lode—a distance of 28 fms. 3 ft. The adit level has been cut open for a distance of 90 fms. for a like purpose, and is now ready to receive the rails. In cutting open the adit level for a distance of 25 fms. west and 35 fms. east of the adit cross cut to the lode, a rich course of blende ore has been found, intermixed with copper of a good percentage, and lead ore. Over this I estimate (and it may be considered a very low estimate) that from 1200 to 1500 tons of blende ore is laid open, that at present prices can be worked away, when good dressing machinery is erected, at fully one-third profit, clear of every expense whatsoever attending on returning it into money. At a distance of 25 fms. west from cross-cut a cross cut was put in south about 3 fms., passing through a magnificent lode, and yielding from 2 to 3 tons of solid blende per fathom. At a distance of 35 fms. east of cross-cut a cross cut was also driven in about 3 fms., and passed through a lode that will yield 1½ ton of lead ore of good quality per fathom, and showing for 15 fms. from this point in the bottom of the adit an equally rich course of ore for this mineral. Beyond this point eastward there is a junction of three or four lodes, which instead of increasing the value of the main lode has been the means of diminishing it, and of separating and disordering all the veins for some distance eastward, and this may be explained by the following cause. At and near these junctions a large flookan, or soft clayey course, has come in, and has taken up the ground, so that it had to be secured by timber for many fathoms in length, but by driving east on a branch of the lode we are now clear of this impediment, and by continuing the driving on this branch we shall soon be again in the right path of the main lode, and free from everything that should interfere with our finding the lode again productive. In order to prove that the main lode was not left standing by our sides near the junctions and the flookan alluded to, I advised the cross-cut south to be continued 7 fms., without, however, finding the vein, and also north 10 fms., with a like result. I am, therefore, confident of finding the lode again a short distance ahead of our present drivage, and when found I believe it will be found productive. It will now be necessary for me to call your attention to the fact that the discoveries of blende and lead made to the west and to the east of the cross-cut have such an underlie that in from 12 to 15 fms. they will fall together and unite into one mass, and at this depth I look forward with a moral degree of certainty that such a rich course of ore for lead and blende will be found for the distance named as has not been laid open in this county for the last 50 years. I can only say that no man possessing the slightest knowledge of mining, or the mines of this county and their antecedents, could predict otherwise. I have always, from the commencement, thought, spoken, and written impartially on this property, and my faith and belief in its making one of the richest, most lasting, and most profitable of the mines ever worked in this county remains undiminished and unbroken. It only now remains for me to advise the removal of your present machinery from Cae Gynon, and to erect it without further delay on your own property, which will cost less than what is required to be paid by you for using the machinery in its present position, and this done, success is secured.—ABSALOM FRANCIS.

The CHAIRMAN announced that the whole of the shares are now allotted, payable by instalments, and that he considered 7s. 6d. per share upon the last 5000 shares will be ample to put the mine into a dividend-paying state, there being now about 300*l.* worth of ore on surface awaiting the erection of dressing machinery.

SOUTH CARADON MINING COMPANY.

At a general meeting of shareholders, held at the mine on Tuesday (Mr. RICHARD KITTOW in the chair), the accounts for seventh, eighth, and ninth months showed a profit of 502*l.* 15s. 11d. A dividend of 512*l.* (1*l.* per share) was declared, and the balance of 2532*l.* 14s. 10d. carried to the credit of next account.

It was proposed by Mr. RICHARD HAWKE, and seconded by Mr. RICHARD S. RABY, and carried unanimously—That this meeting desires, on behalf of the shareholders, to tender their best thanks to Mrs. Norris for the great kindness and liberality that she has always displayed towards them from the commencement of the mine, and especially at the present time, in taking into consideration the very depressed state of mining, and freely consenting to a reduction of the dues from 1-15th to 1-30th, thus showing the deep interest she feels in the future of the mine. They also desired to thank Capt. Hawker (Mrs. Norris's son-in-law), who has the management of the estate, for the courtesy shown by him to the gentlemen deputed to see him on the business. The following report was read:—

Nov. 26.—I am pleased to say the mine, on the whole, is still looking well; but owing to the very low price of copper ore we are obliged to return large quantities even to pay the working cost. We venture, however, to hope that we shall soon see an improvement in the copper market, and so obtain better results.—JOHN HOLMAN.

BEDFORD UNITED MINING COMPANY.—At the half-yearly meeting of shareholders, held on Thursday (Mr. R. McCullan in the chair), the accounts of receipts and expenditure, together with a balance-sheet made up to Oct. 31, were passed and allowed. The directors' report was read, and the Chairman said he believed that little more could be said than what was contained therein. The continued low price for copper had necessitated a careful consideration by the directors as to dealing with the large reserves, and they were of opinion that they were adopting a prudent course in raising no more ore than was necessary to meet the expenditure. The position of the mine, financially and prospectively, was fully discussed, and the shareholders were quite satisfied that they had a good and lasting property in the mine, and that a better price for copper ore would soon alter the position of affairs. The question of dues, which are 1-15th on all ores raised, was again brought up, and it was unanimously resolved to ask the Duke of Bedford to make a reduction or a remission till better times arrive. It was stated that the Duchy had most considerately entertained a similar application from a neighbouring mine, and had consented to reduce the royalty during pleasure to 1-100th. A vote of thanks to the directors concluded the business of the meeting.

[For remainder of Meetings see to-day's Journal.]

THE SCOTCH MINING SHARE MARKET—WEEKLY REPORT AND LIST OF PRICES.

During the past week business has been inactive and prices drooping. The usual fortnightly settlement is now in progress, and little disposition is yet evinced to buy for next settlement—Dec. 13. Particulars of the continuation business done are given below. A want of confidence prevails, partly due to political and partly to unfavourable commercial influences. The depression in trade appears to be increasing, so the prospect of some revival which the downward movement of the money market has encouraged is still in abeyance.

Shares of coal and iron companies are generally flat. The Scotch iron trade continues in a wretched state. Miners' wages have, indeed, been reduced, but the value of iron has fallen more in proportion, and although it is now selling far below the cost of production the tendency is still downwards. Many people are now looking forward to the total extinction of this trade in time, unless important concessions are soon made in the royalties by landlords, and in the rates by railways. No further decline can reasonably be asked for in the miners' wages, and it is useless to hope prices will rise sufficiently to mend matters. The Shotts Iron Company announce a general reduction of wages to all persons in their employment to take place on Dec. 9. The movements this week are mostly downwards, Clyde Coal shares being reduced 3*l.* 10s. each, Cairntable 10s, Chillington and Monkland (pref.) each 5s., Benhar 3s., Marbella 2s. 6d., also Omoa and Cleland 2s.; while Scottish Australian are 2s. 6d. higher, and the new shares 1s. 3d. The principal business has again been in Benhars, which declined from 25s. to 20s. on unfavourable rumours, but are now tending better. Reductions would be taken for Chapel House shares, as well as the 7½ per cent. debentures. Andrew Knowles and Sons (20*l.* paid) are at 8¼ dis.; ditto (25*l.* paid), 10 dis.; and ditto (all paid), 34¼. Antrim, A, 30s.; ditto, B, 27s. 6d. Bolckow, Vaughan, A, 52 to 52½; ditto, B, 33. Cardiff and Swansea, 20s. Chatterley, 40 dis. Chillington, 45s. to 55s. Ebbw Vale, 5 to 5½. Greet Western, 40s. John Brown and Co., 1² dis. John Bagnall and Sons, 17s. 6d. Muntz's Metal, 3 prem. Newport Abercarne, 90s. Parkgate, 21 dis. Pelsall, 10¾ dis. Rhymney, 14 Scottish Australian, 30s. to 35s. Sheepbridge, 35 dis.; ditto (new), 7. Silkstone and Dodworth, 31 dis. Sandwell Park, 15½. Staveley, A, 5 dis.; ditto, B, 1s. 3d. dis.; ditto, C, 60; and ditto, D, 10. South Wales 50s. Tredegar, A, 10½. West Mostyn (pref.), 16s. 3d.

In shares of foreign copper concerns, Tharsis have advanced 12s. 6d, and Huntington 5s., while Tharsis (new) are lower. Tharsis at one time advanced to 23¾, and, after dropping to 22, are again tending upwards. New Quebrada have improved, as, though they have a considerable loss on last half-year, it would appear the improved management, energetic working, and new machinery are going to make the undertaking successful. The last sale by the Cape Company realised 11s. 9¾d. per unit. Yorke Peninsula unaltered, as better prices for copper and increased ore returns are wanted to cause a demand for the shares. Cape are at 29 to 30, New Quebrada, 37s. 6d. Rio Tinto, 5 per cent., 59½. Yorke Peninsula, 2s. 6d. to 3s. 9d.; ditto (pref.), 10s. to 15s.

In shares of home mines Glasgow Caradons are 1s. lower. The last sale of 220 tons of copper ore by this company realised 97*l.* 15s. 6d., or an average of 88s. 6d. per ton, and compares with 200 tons, at 87s. 9d. per ton last month, while the sales in November for some years past have been:—In 1877, 193 tons, at 73s 5d.; in 1876, 240 tons, at 110s. 4d.; in 1875, 245 tons, at 105s. 6d.; in 1874, 240 tons, at 125s. 6d.; and in 1873, 250 tons, at 103s. 3d. This is the company's eleventh sale for the current financial year, and the total realised by these sales, as compared with the sales in the corresponding period of 1877, shows a decrease of 1548*l.* In August a decrease of 1959*l.* was shown on eight sales to that month, in the same way; so it would appear that the improvement which set in with the September sale is making very satisfactory progress. Tin shares continue in request, owing to the rise in that metal. Killifreth are still neglected, although those who have lately inspected the mine think the shares are likely to rise very much since tin is improving. Lead shares are generally firmer, and shares of the new company mentioned last week—Cornwall Mining (Limited)—are in request. Bampfylde are at ¼; Boditris, 13s. 9d.; Dolcoath, 30¾; East Van, 1½ to 2; Great Laxey, 17 to 18; Leadhills, 2 to 2½; South Condurrow, 10½ to 11; West Tankerville, 1s.

In shares of gold and silver mines Richmond have improved on a cablegram received from the mine that it is opening up splendidly. As the mine paid about 60 per cent. last year, and the ore in sight will run the furnaces over a year, it is expected that the manager, who has hitherto been successful under trying circumstances, will now make larger profits, but it must always be kept in mind that these American mines are so fluctuating that it is often a bright time like the present is a better opportunity to sell than to buy. St. John del Rey, on the other hand, is a very steady concern, and its dividend is not likely to be lower, but it may not increase for a few years over 30 per cent., which, however, is very good. Last month's produce showed an improvement, and the profits were 580*l.* An improvement is reported at Almada and Tirito. All underground works are being pushed ahead at New Zealand Kapanga, with encouraging indications. The produce of St. John del Rey in the first division of November is 12,750 ozts., and that of Don Pedro 750 ozts. A meeting of the New Zealand Manganese Mine will be held on Dec. 4. Birdseye Creek are at 13s. 9d. Colorado, 37s. 6d. Exchequer, 2s. 6d. to 3s. Emma, 2s. Flagstaff, 5s. Frontino, 37s. 6d. Javali, 7s. Sierra Buttes, 36s. 3d. South Aurora, 2s. 6d. to 3s.

In shares of oil companies, Young's Paraffin are 5s. higher at 13¼, although some business was done at 1 16th more. Oakbank shares are now ex div. Uphall, 12s. 6d. lower. Runcorn Soap and Alkali are at 7½ dis. There is nothing doing in shares of miscellaneous companies. Hopkins, Gilkes, and Co. offered at 10⅝ d's. In wagon companies' shares, Scottish are offered 2s. 6d. lower, at 9⅞, and the new shares 1s. lower, at 77s. Quotations of others are—Birmingham, 16; Bristol and South Wales, 7½; Gloucester, 7¼; Metropolitan, 42s 6d. premium; Midland, 14; Railway Carriage, 95s.; and Swansea, 20s. In chemical companies' shares prices are—Langdale's, 85s. to 90s.; Lawes', 8¾ to 9; Newcastle, 41s. 3d.; and Northern Agricultural, 8¼ to 9½.

On contango-day (Tuesday) the following were the rates of continuation current:—Contangos: 1½d., 4½d. on Benhar Coal; 1½d. on Glasgow Caradon; even on Huntington; 2½d. on Marbella; 1s. 3d., 1s. on Richmond; 3l., 6l. on Tharsis; 3d., 4d., 4½d. on Uphall Oil.—Backwardations: 3l., 6l. on Young's Paraffin. On comparing the making-up prices fixed to-day for the shares named with those of the previous settlement, the variations thus shown to have taken place are—Tharsis have advanced 51s, 3l. per share, ditto (new) 25s., Richmond 8s. 9d., Benhar 7s. 6d., Young's Paraffin 6s 3d., and Huntington 5s. Glasgow Caradon, Glasgow Port Washington, and Oakbank Oil are all unaltered, while Uphall are 15s. lower, Monkland 12s. 6d., Marbella 2s. 6d., also Omoa and Cleland 6d.

The following calculations show the yield per cent. on the money invested at present prices in the shares named, based upon the last average yearly dividends being maintained:—Great Laxey Mine would yield 9½, Milner's Safe 5¼, Phospho-Guano 10, Liverpool Rubber 7⅞, Starbuck Car and Wagon 7⅞, Young's Paraffin Oil 11½, Antrim Iron Ore (A) 3¼, and ditto (B) 3⅜.

GLYN LEAD MINING COMPANY.—The recent favourable meeting of this mine has directed more attention to the shares. The property is on the same line of lode and contiguous to the Van. It was decided some time since to amalgamate with another mine in the same district—Van Consols. The arrangement is that the original shareholders get as many 1*l.* shares in the amalgamated company as they held of 2*l.* shares in the old company, and are expected to take a proportion of shares in the amalgamated company. The workings have hitherto been greatly interfered with by hard grit, but it is thought they have now driven beyond its influence, and likely to strike a rich course of lead. The local director found the money to carry on operations at this mine and Van Consols during the present financial difficulties, and said he would not have done so unless the prospects were good. A wholesome feature in the enterprise is that there are no bonus shares, which are so unfair to *bona fide* investors. Altogether the undertaking is now expected to turn out remarkably well.

HUNTINGTON COPPER AND SULPHUR MINING COMPANY (Limited).—The record has been closed in the action by the promoters of this company and others against the present directors, having for its object the overturning of the result of last meeting and to put a stop to the action the present directors were then authorised to carry out against the promoters for reduction of the contract for the sale of the mines and payment of 150,000*l.* The pursuers contend that the directors improperly cast out votes tendered for the abandonment of this action, but the latter allege these votes were simply a continuance of the pursuers' former frauds, in order to conceal their original conduct. The pursuers' plan, it is alleged, was to acquire large lots of the shares, then distribute them so as to secure a maximum of votes, among their relatives, friends, and dependents, and thus outvote the *bona fide* shareholders. The directors held these votes were invalid, because the shares were all transferred to the relatives, &c., at nominal considerations, indicating that they paid nothing for them. If this view proves correct the action will, of course, go on against the promoters. Should the decision be that the votes are valid the action will be abandoned by the company, and there will be no method of testing the responsibility of the promoters except by the inconvenient and costly process of some independent shareholder or shareholders carrying it on themselves.

Capital. Per share.	Paid up.	Dividends. Rate per cent. per annum. Previous.	Last.	Description of shares. COAL, IRON, STEEL.	Last price.
£ 10	£8	£ 7	£ 7†	Arniston Coal (Limited)	90s.
10	10	4	4	Benhar Coal (Limited)	21s.
100	50	22s6d	3 3s6d	Bolckow, Vaughan, and Co. (Lim.)	A. 52½
10	10	10	10	Cairntable Gas Coal (Limited)	7
10	10	4s	April, 1876	Chillington Iron (Limited)	55s.
10	7	—	—	Clyde Coal (Limited)	60s.
23	20	10s	Dec., 1874	Ebbw Vale Steel, Iron, and Coal (Lim.)	5
10	6	nil	nil	Fife Coal (Limited)	70s.
10	10	nil	nil	Glasgow Port Washington Iron & Coal (L)	40s.
10	10	—	—	Ditto Prepaid	40s.
10	10	—	—	Lochore and Capledrae (Limited)	45s.
10	10	nil	3	Marbella Iron Ore (Limited)	35s.
10	10	nil	nil	Monkland Iron and Coal (Limited)	17s. 6d.
10	10	5	4	Ditto Guaranteed Preference	40s.
100	100	nil	nil	Nant-y-Glo & Blaina Ironworks pref. (L)	20
6	6	nil	nil	Omoa and Cleland Iron & Coal (L. & Red.)	5s.
1	1	15	15	Scottish Australian Mining (Limited)	35s.
1	10s.	15	15	Ditto New	16s. 3d.
Stock	100	nil	nil	Shotts Iron	70
				COPPER, SULPHUR, TIN.	
4	4	—	—	Canadian Copper and Sulphur (Lim.)	8s.
10	7	77s 6d	35s*	Cape Copper (Limited)	29
1	1	7½	2¼	Glasgow Caradon Copper Mining (Lim.)	19s.
1	15s.	7½	2½	Ditto New	13s. 6d.
10	9¾	nil	nil	Huntington Copper and Sulphur (Lim.)	15s.
4	4	—	—	Panulcillo Copper (Limited)	20s.
10	10	6†	6†	Rio Tinto (Limited)	6os.
20	20	7	7	Ditto, 7 per cent. Mortgage Bonds	14/ 3s 9d
100	100	5	5	Do. 5 p.ct. Mor. Deb. (Sp. Con. Bds.)	61
10	10	22½	20	Tharsis Copper and Sulphur (Limited)	22½
10	7	22½	20	Ditto New	14½
1	1	—	—	Yorke Peninsula Mining (Limited)	5s.
1	1	—	—	Ditto, 15 per cent. Guaranteed Pref.	17s. 6d.
				GOLD, SILVER.	
1	1	—	—	Australian Mines Investment (Limited)	8s.
5	5	7s. 6d	7s. 6d	Richmond Mining (Limited)	10/ 3s 9d
				OIL.	
10	7	6	15	Dalmeny Oil (Limited)	8¼
1	1	7½	25	Oakbank Oil (Limited)	36s.
1	5s.	—	25	Ditto	10s. 6d.
10	10	7½	2	Uphall Mineral Oil (Limited) "A"	90s.
10	10	—	—	Ditto "B" Deferred	10
10	10	—	—	West Calder Oil (Limited)	15s.
10	8½	17½	17½	Young's Paraffin Light & Mineral Oil (L).	13¾
				MISCELLANEOUS.	
50	25	5	6	London and Glasgow Engineering & Iron Shipbuilding (Limited)	23½
7	7	15	10	Phospho Guano (Limited)	8¾
10	10	6	6	Scottish Wagon (Limited)	9¾
10	4	6	6	Ditto New	77s.

† Interim. ‖ Per share. * For six months of 1878.

NOTE.—The above lists of mines and auxiliary associations are as full as can be ascertained, Scotch companies only being inserted, or those in which Scotch investors are interested. In the event of any being omitted, and parties desiring a quotation for them and such information as can be ascertained from time to time to be inserted in these lists, they will be good enough to communicate the name of the company, with any other particulars as full as possible.

J. GRANT MACLEAN, Stock and Share Broker.

Post Office Buildings, Stirling, November 28.

THE MINES OF MIDIAN.—At the Society of Arts on Wednesday Capt. R. F. Burton read a paper on Midian and the Midianites. He commenced his travels in Midian in 1877 by instructions from the Khedive, and as the result of his first expedition brought back specimens of gold, silver, and in fact all the metals mentioned in the book of Numbers, to such an extent as entitled him to call his prefatory volume, The Gold Mines of Midian. In the next year he further pursued his discoveries, being accompanied by 6 Egyptian officers (including two staff), an escort of 25 negro soldiers armed with Remingtons, and a gang of 30 unarmed miners and quarrymen. A sketch of the incidents of a hazardous journey was then given, the party finding everywhere traces of extensive ancient mining operations, and indications of immense labour abounded. Bags of the true turquoise matrix were secured, and a discovery was made of the dodge of the Arabs for producing pearls,—that of inserting a grain of sand under the shell of the live oyster. The expedition as it travelled along came upon the ruins of ancient cities, mining colonies, varieties of picturesque scenery, and innumerable proofs of a rich and flourishing state of things which had long since passed away. But better days were he trusted in store for the land of Midian. The

Anglo-Turkish Convention placed Great Britain with reference to Arabia in the same position as that occupied by Rome after the days of Augustus. He had a full and perfect faith that Midian, like many other provinces, would before long awake from her sleep of ages. She offered to the world not a mine but a mining region, some 300 miles long, with an inner depth as yet unknown; and what the ancients worked so well the moderns would work still better. Let them look forward then to the development of her mineral wealth under the fostering care of European and especially of English companies, and they might expect to see the howling wilderness, like Algiers before 1830, rival the rich and fruitful produce of Algiers in 1878.

Registration of New Companies.

The following joint-stock companies have been duly registered:—

BOLTON CORN MILLS COMPANY (Limited).—Capital 18,000*l.*, in shares of 5*l.* The carrying into effect a certain agreement between Jonathan Edge, of Bolton, and S. Horrocks, of Bolton, on b half of certain persons proposing to form a company. The subscribers (who take one share each) are—Jonathan Edge, Great Lever; James Edge, Great Lever; R. Edge, Great Lever; J. Crossland, Bolton; E. Smith, Bolton; S. Horrocks, Bolton; David Smith, Bolton.

LYTHAM FLORAL PAVILION COMPANY (Limited).—Capital 15,000*l.*, in shares of 5*l.* The acquisition of land or buildings in Lytham for a pavilion, covered promenade, concert hall, &c. The subscribers (who take one share each) are—W. Pilling, Lytham; J. Collinson, Lytham; R. Rainford, Lytham; R. Waring, Lytham; R. Crozin, Lytham; W. Bagot, Lytham; E. B. Taylor, Lytham.

ALLIANCE PHOSPHATE COMPANY (Limited).—Capital 30,000*l.*, in shares of 10*l.* To purchase and otherwise acquire deposits or beds of phosphate of lime and other phosphatic substances, mineral products, &c, in the West Indies, or elsewhere. The subscribers (who take one share each) are—W. Godden, South Norwood Park, merchant; A. Murray, Broadmoor Begelly, surveyor; W. Veale, Walkhampton, engineer; E. Ahmead, 62, Cornhill, accountant; R. J. Phillips, Holloway, clerk; W. Kendall, Dalston, clerk; G. Walker, Regent's Park-road, consulting engineer.

WAREHOUSEMEN AND CLERKS' DIRECT SUPPLY ASSOCIATION Limited).—Capital 50,000*l.*, in shares of 5*l.* and 2*l.* each. To carry on the business of a co-operative supply association in all its branches The subscribers are—R. Rose, Forest Hill, 100; W. C. Anderson, Kensington, 100; J. B. Faulkner, Forest Hill, 100; W. Bacon, Islington, 100; T. Dermer, Croydon, 100; E. Brook, Croydon, 100; G. Courtice, Denmark Hill, 5.

HESCWM SLATE AND SLAB COMPANY (Limited).—Capital 30,000*l.*, in shares of 1*l.* each. To acquire by purchase the Hescwm Quarry and the Hescwm North Quarry, in the county of Pembroke, and any other mines in the neighbourhood, and to work the same. The subscribers (who take one share each) are—W. Morgan, Bayswater; T. Jones, Notting Hill; J. Aguilar, 12, Great Winchester-street; H Parker, Colebrook-row; J. McCollough, 81, Bishopsgate-street; P. L. Van den Berghe, 83, Abchurch-lane; S. Stacey, Stoke Newington.

LANCASTER COFFEE TAVERN COMPANY (Limited).—Capital 5000*l.*, in shares of 1*l.* each. To establish houses, rooms, &c., in Lancaster, and to carry on the business of general refreshment house keepers, no wines, ale, or spirituous liquors to be sold. The subscribers are—H. Welch, Lancaster, 50; A. Seward, Lancaster, 20; R. Mansergh, Lancaster, 100; E B. Dawson, Lancaster, 100; R Ray, Lancaster, 10; Wm. Welch, Lancaster, 50; E. Jonnson, Lancaster, 50.

GIBELLINI SULPHUR COMPANY (Limited).—Capital 10,000*l.*, in 5*l.* shares: 1360 preference and 640 deferred. To acquire on lease or otherwise, and working of any sulphur mines in Sicily the preparing and selling the produce of such, and carrying on such operations in Sicily and elsewhere. The subscribers are—J. Pulley, Lower Eaton, gentleman, 100; A Devonport, 4, Chapel-street, W., gentleman, 1; W. Baines, 26, Portland-place, gentleman, 1; A. Raymond, 35, Culthorpe-street, gentleman, 1; W. Secker, 10, Altheara road, gentleman, 1; D. N. Scott, 8, Charles-street, gentleman, 1; W. Millar, 123, Upper Grange road, gentleman, 1.

REGULATION OF ELECTRIC CURRENTS.

Some twelve months since Mr. I. L. Pulvermacher patented some improvements in batteries, and also in automatic compensating galvanometers, and various other things of the same kind, such as the manufacture of electro-motive engines, the formation of metallic brushes containing miniature batteries, and so on. The patent has not been obtained, but the provisional specification filed in April is now open to the public. The lower part of the battery is composed of a basin with a double bottom, or of two such receivers hermetically joined. The bottom of the upper receiver (when two are employed) is pierced with holes intended to receive the central rods or plugs furnished each with an annular depending lip for the purpose of providing an annular cavity remaining always dry. The central rod is made fast to the bottom of the upper receiver. When the plug (preferably of india-rubber) with a central rod is in position it is covered by a kind of little hood or envelope, and inserted into a porous tube encircled with silver wire; and the said cylinder rests on a little ledge terminating the plug or stopper; this tube is then firmly fixed. The rod has a hole in its centre running through its entire length. Opposite the upper opening of this hole the little hood may be slit, so as to form a small valve, for which any other kind of valve may be substituted. The elements thus placed, maintained in a fixed position at bottom by the plugs or stoppers before referred to, are also maintained at top by a basin with holes mounted on columns of a height corresponding with the length of the porous cylinders. In the bottom of this basin are holes corresponding with the number of elements fixed or mounted in the basin with a double bottom. The upper ends of the cylinder have passed over them another appendage of india-rubber or other material, which secures at the same time a waterproof lodgment for the upper end of the porous cylinders. The cylinders projecting above the appendage have each a hole in their side, giving access to the exciting liquid at the moment when the basin is filled to the level of this hole. The extreme upper ends of these porous cylinders are mounted with metallic arms or projection pieces for establishing the contact with the zinc rods or hollow cylinders placed in the elements. The double bottom basin is provided with two taps or cocks, one at the bottom for the exit of the liquid, and the other at the top for the exit of air when needed, both of which are kept closed so long as the cylinders are to be kept filled with liquid. The liquid not being able to run down into the double bottom basin by reason of the imprisoned air, the element containing zinc is thus charged. The filling of the porous cylinder is obtained in a similar way to that already described in his former specification hereinbefore referred to, but for emptying the cylinders of the existing liquid the bottom tap only need be opened, when the liquid will run out by force of gravity.

According to the second part of the invention a galvanometer apparatus, whose bobbin carries the multiplying wire, is supported by four little columns, so that in the axis and on the circular plate forming the base of the galvanometer may be placed a trough intended to contain mercury, and which constitutes the compensator, with the various parts connected with it. On the bottom of the apparatus is placed an elongated trough, with a resistance blade mounted as a balance, in a similar manner to that described in his previous specification. The free end of this blade is connected by a thin silk wire with one end of the magnetic galvanometer balance above it, so as to raise or lower the blade by the movement obtained from the electric current passing through the multiplicator. According to the direction of the current it will raise or lower the blade, and thus dip it gradually in the mercury, or withdraw it gradually therefrom; but when the current is in the opposite direction the deflection of the balance will not be prevented by reason of the thin silk thread offering no obstacle thereto. A counterweight is also provided to equilibrate the weight of the compensator resistance blade or balance, and the plates which it carries. According to the third part of the invention he produces a pendulum timekeeper by fastening a pendulum in the centre of the magnetic balance, and using two resistance blades instead of one, produced as described in his former specification, each resistance blade being connected with the battery in such a manner that the direction of the current when one blade is in the mercury is opposed to that required to dip the other blade into the mercury.

FOREIGN MINING AND METALLURGY.

The intelligence which comes to hand from the French coal mining districts seems to indicate a sensible improvement in the general tone of the Belgian coal trade. Transactions have been almost everywhere animated, deliveries have been numerous, and stocks have been reduced. Prices have not varied, but it is hoped that they will tend upwards if the present state of affairs should continue. The principal client of the Belgian coal trade, the metallurgical interest, is still in a precarious condition, and the sugar-works have not been giving out any more orders. But whatever be the cause of the improvement in the Belgian iron trade, it certainly has improved, and we can but indicate with satisfaction the change for the better which has taken place. M. Crabbe, formerly Commercial Inspector on the Eastern of France Railway, has recently founded at Charleroi an agency for the circulation of information upon matters connected with railway and canal traffic.

The Belgian iron trade is still in an unsatisfactory condition. Working operations are certainly still carried on, but the production currently effected is by no means the result of orders actually received. The works are employed with an eye to the future, and also in order to occupy the working staff. The only works which can still be said to be satisfactorily employed are the steelworks; these establishments, notwithstanding the reduced rates current, can still realise profits. The Angleur Steelworks Company has just received an order for 1000 tons of steel rails for the tramways at Algiers. Other steel rail contracts are also stated to be in course of negociation. The Angleur Steelworks Company has, by the way, just issued its balance-sheet for 1877-8. The company has, it appears, been enabled to make good a loss sustained in the preceeding exercise, to apply a large sum to the depreciation of plant, and finally to distribute a dividend upon its share capital at the rate of 5 per cent. per annum. The Swiss Federal Council has just "denounced" for Nov. 15, 1879, a treaty of commerce concluded Dec. 11, 1862, between Switzerland and Belgium. The Federal Council has, however, at the same time informed the Belgian Government that it is ready to enter into negociations for the conclusion of a new treaty. A recent circular of Prince Bismarck is, it appears, entirely based upon Protectionist ideas.

The Dutch Government has invited tenders for the supply of 24 turntables for the Government railways in the Dutch Indies. A contract for 34 locomotives is about to be let at Bromberg. The general direction of railways in Alsace and Lorraine has invited tenders for the supply of 146 miles of Bessemer steel rails and 58,000 fish-plates also of Bessemer steel. The execution of the canal works contemplated by M. de Freycinet, the French Minister of Public Works, will involve an outlay of 15,200,000*l.*; this is a matter, of course, of considerable interest and importance to the French coal trade.

The iron trade has presented little activity in the French department of the Haute-Marne; work is still, however, fairly maintained at the furnaces, rolling-mills, and mechanical construction establishments. Quotations for iron have been sustained, producers having decided not to accept lower rates, and to stop operations if necessary. Coke-made iron has made 6*l.* 8s. to 6*l.* 12s. per ton, and mixed iron 7*l.* 12s. per ton. In the Nord some buyers have shown a disposition to make purchases of some little importance, but the proprietors of ironworks have displayed little readiness to accede to the offers made to them, and have declined to enter into any engagements for a more distant period than January, 1879. First-class rolled iron has made 5*l.* 16s. to 6*l.* per ton, according to the importance of affairs. In the Loire-et-Rhone group the week has been a comparatively dull one; the orders anticipated from certain railway companies do not come to hand very readily. The demand for iron of commerce has been very restricted in the Loire-et-Rhône.

FOREIGN MINES.

ST. JOHN DEL REY.—Telegram from Morro Velho, dated Rio de Janeiro Nov. 28: Produce 12 days, first division of November, 12,750 oits.=4940*l.*; yield 6·2 oits. per ton. Profit for the month of October, 5800*l.* All going on well.

DON PEDRO.—Telegram from Rio, dated Nov 24: Produce cleaned up (first division of November), 750 oits

ALMADA AND TIRITO CONSOLIDATED.—Telegram from Mr. Clemes: Improvement on docile ore stopes. We have remitted you bullion, Nov. 9.

PLACERVILLE GOLD QUARTZ.—Thos. Price, Nov 6: I am pleased to be able to inform you that the shaft was down to the depth of 58 feet on Saturday, Nov. 2, 10 ft. having been sunk during one week. The shaft is now in the footwall, being out of the quartz entirely; hence the reason of the more rapid sinking. The winze was down at the same time 52 ft., 4 ft. having been sunk during the last week. The vein is widening, there being not less than 4 ft. in width of extra good quartz, prospecting rich in gold.

MINERAL HILL.—Mr. Plummer, Oct. 31: The following is the statement of last shipment of bullion:—

No. 9.—1386 ozs. ...	...	Silver, fine	·962	... ...	Value $173 3 90
		Gold	·002	... ...	57·24
No. 10.—1340 ozs. ...	...	Silver, fine	·963	... ...	1668 43
		Gold	·001	... ...	27 73
No. 11.—1424·4 ozs.	...	Silver, fine	·970	... ...	1736 34
		Gold	·001	... ...	9 48
No. 12.—1528·5 ozs.	...	Silver, fine	·986	... ...	1936·76
		Gold	·00 ½	... ...	47 28
No. 13....1666·6 ozs.	...	Silver, fine	·975	... ...	2100·91
		Gold	·001	... ...	34·49
Total					Value $9412 56

RICHMOND.—R. Rickard, Eureka, Nevada, Nov. 7: Since my last there has been no change of importance to report from the mine. The 400 quartzite drift has been extended 8 ft. without any change. The 500 south, on fissure has been driven 31 ft; ground very favourable, with orey indications. No. 2 winze, below the 500, is down within 6 ft. of the level of the 600. The cross cut from ore body in the 500 has been holed to the south drift on fissure, and a railroad has been put in, and drifting on the ore has been started to prove the size of the ore body on this level. The 600 cross-cut, towards No. 2 winze, has been extended 20 feet; ground in present end hard. The 600 west drift has been extended 17 ft. without any material change. The 800 quartzite drift has been extended 15 ft on the contact. There is nothing new to report in any other portion of the mine. The reconstruction of the works is being pushed on with all possible speed. The ironwork for the furnaces will be shipped this week from San Francisco, and the roofing was only shipped yesterday from Pittsburgh; it will be here as soon as we are ready for it

— Telegram from the mine at Eureka, Nevada: Mine improving daily, drifted 70ft. from raise, 80 ft. above 500; good ore making up towards Tip top.—RICKARD.

NEW QUEBRADA.—The Ottawa arrived at Swansea on the 28th inst. with a cargo of yellow pyrites—450 tons.

COLORADO UNITED.—Nov. 25: The superintendent's letter, dated Nov. 2, is to hand this morning. He says—Having taken the proper point in the shaft for the 8th level plat, I have let a contract to cut 10 ft. wide, 12 ft. long, and 16 ft. high, for 3230. I have started in the east from the shaft, and hope by the end of the month to have it connected with the level drifting west, and have the 8th level opened from shaft to shaft, and No. 3 stope 29 fathoms in length, and a 13 fm. back, entirely in reserve. In the middle of the month (October) the mineral in No. 2 stope was rather split up, but has again come together, and this morning we have 8 in. of solid mineral in the stope, valued at 250 ozs. to the ton. The No. 1 stope in the 8th level is also daily improving, and we shall this month take a considerable quantity of ore out of the block. The 8th level drift, 400 ft. west from the Terrible shaft, is hard. There is a nice little streak of mineral in it, but for the last 100 ft. we have had tight ground. There is a good crevice all through, nice-looking walls, and the ground, although hard, breaks freely. The Union Tunnel drift, which has been for the last 120 ft. very hard, changed for the better in the middle of the month, and now looks very well. We have worked the first 100 ft. of this stope with a back of 10½ fms. From this point for the next 150 ft., where the ground has been hard, I intend to raise on the drift west, starting on at the point 250 ft. in, and then work back east on the mineral. By this means I shall save working some 12 to 15 fms. of hard ground. The breadth of this drift having lately changed for the better is very important, it being the western point of our property. In the 5th level I am working four drifts, and as I advised in my letter of October 15, a nice streak of mineral was on the hanging-walls. The mineral is not much more than facings, but of rich ore, and extends for nearly 100 ft. I shall this month (November) take out several tons of ore from this block. The lode in the Silver Ore Tunnel is opening up very nice. The lode is well-defined good walls, and the ground is excellent, and breaks freely. The lode is about 4 ft. wide, and mineralised throughout with specks of galena and argentiferous gray copper, and in the east drift at the breast we have to-day 2 in. of solid mineral. A fair specimen of the same assayed 91 ozs. of silver to the ton. The breast of the tunnel continues the same, with very hard ground. We have taken out from the Brown Mine during the month from 9 tons to 10 tons of ore, averaging 160 ozs. of silver to the ton. The stope is looking well throughout, and I expect to take out daily ¾ ton of mineral this month, worth 160 ozs. of silver per ton. The dressing works have been working very well, but for the last week we have had severe frosts, and have been obliged to work by steam.

CAPE COPPER.—Capts. Henwood and Lanksbury write of Ookiep, Oct. 16: In the 68 east from under the new shaft the ground is improving; the present end is worth 3 tons per fathom. They also refer to the fact that they are opening out some valuable ground at the 68, east of No. 24 winze.—Bills of Lading received:—700 tons per Glenudal.—Sale by Public Tender: On the 20th inst. 50 tons, at an average of 11s. 9¾d. per unit, realising approximately 965*l.*

NEW ZEALAND KAPANGA.—J. Thomas, Oct. 14: Coromandel Shoot: The No. 2 winze south of sump winze has been sunk since my last 4 fms.; total depth under the 60 7 fms. At this depth I put the men to drive north and south on the course of the lode, and they have driven 2 fms. each way. The lode is larger and stronger going down than in any other part of the mine, and yielding occasionally very rich gold quartz very much mixed with antimony and arsenical metallic pyrites. The metallic nodules or blistered scales occur in patches. This extraordinary metallic compound is never seen without gold, and is the surest indication accompanying it. The south stope above the 60 has been stoped 3 fms. long and 2 fms. high on the run of ground above the No. 2 winze. The lode continues the usual size of 2 ft. wide, highly charged with the gold-bearing minerals, and yielding in places rich specimen quartz and the average crushing stuff, with every prospect of becoming better.

Albion Shoot: This stope above the 50 has been further stoped 4 fms. long and 2 fms. high; the lode has been very kindly looking, and very regular, averaging 1 ft. wide, consisting of true gold-bearing quartz, with a deal of strong mundic mixed through the lode; no specimen stone or visible gold has been seen here for the month, consequently the general lodestuff, when no gold is seen, yields very poor in crushing. Not meeting with the success anticipated in this part of the mine I am of opinion the dip of gold-bearing ground that was found so rich in the upper levels has taken a heave northerly. I have set a contract to drive on the 50 end north on the course of the lode 10 or 15 fms. to see if the rich run of ground can be obtained. The caunter leader has been further driven on the course of the leader 5 fms., length now driven 8 fms.; this branch keeps an easterly course, and appears to be a feeder running off from the main lode; it consists of soft rubly quartz mixed in a flookan course full of fine black mundic, averaging 1 ft. wide; these cross-branches are often found to be very rich, and the indications seen can scarcely be better without having gold.

Crushing: The quantity of general quartz crushed from sinking under the 50 from No. 2 winze has been 10 tons, yielding 12 ozs., with 22 lbs. specimens yielding 40 ozs. From the south stope 15 tons of quartz, yield 14 ozs., with 25 lbs. specimens, yield 18 ozs.; the stops above the 60 20 tons general quartz, yielding 4 ozs.; total quartz crushed, 45 tons; specimens 47 lbs., producing 88 ozs. melted gold. The machinery and pitwork continue in good order, and all the underground works are pushed ahead with every dispatch possible.

PESTARENA UNITED (Gold).—Nov. 16: District Pestarena: Good progress is being made in clearing the old Beck shaft. So far as seen six of the cast-iron flanges to the pipes are broken, but within a day or two we shall be able to order all the castings required for repairs to the pipes, and whilst they are being made the foundations of the walls will be put into the shaft. The stopes and ends in the mine continue much about the same as when reported on the 7th inst. The eight mills in No. 2 mill department have worked all the month, and on the 9th we resumed six of the mills in No. 1 mill house. As yet I am not in a position to say how much gold will be obtained in this district for the present month.—District Val Toppa: There is no change in the end driving south of Zero level on the caunter branch. In the end driving north of the Intermediate level under Zero the lode is rather improved. The lode in the stopes in back behind end is not looking so well as when reported on the 7th inst. The lode in the Intermediate end driving south has increased in size, now being about 3 ft. wide, and producing stones of saving work. There is little change in the end south of No. 1 level or the drive above it, on the western branch. There is no change in the end south on the western lode, but in the two intermediate ends driving south on the lode, and under this level, we have a slight improvement.—Great Quartz Lode: In the end south of No. 2 level, on the line of this lode, the lode is yielding about 6 tons to the fathom, worth 2 dwts. of gold per ton. In the cross-cut west of No. 5 level we have cut through another small vein of quartz, a trial of the ore from which will be made next week. So far as we have gone the gold production at Val Toppa is in about the same proportion as that of the past month.

THE BESSEMER PROCESS FOR COPPER PYRITES.

Some interesting particulars concerning the results obtained with HOLLWAY'S process for treating iron pyrites have just been published. In the ordinary process of roasting sulphides of copper and iron in the reverberatory furnace or finery, an excess of oxygen is caused to act on the surface of the mass, whereas when air, as in Hollway's process, is driven through molten sulphides, the latter being in excess, the whole of the oxygen of the air introduced is utilised. Working under these conditions with a Bessemer converter at Penistone some novel phenomena were observed. In the early stages of the operation pure nitrogen was evolved from the mass, probably containing free sulphur in suspension, which appeared suddenly to give way to current of sulphurous acid and nitrogen. Starting with molten protosulphides containing 3½ per cent. of copper, and oxidising about 90 per cent of the sulphide of iron in the blow, the point at which this change took place was about one-third of the time necessary to complete the oxidation. It has been suggested by Mr. William Galbraith that the reactions may be thus explained. At the excessive temperature produced by rapid oxidation, as in Holway's process, there is the tendency to form low sulphides—for example, white metal, which is a subsulphide of copper, and assuming $4FeS + 2O = 2FeO + Fe_2S + 3S$, the presence of low sulphides can be readily understood. It need only be assumed that this reaction completes itself before sulphur is acted on by the oxygen to ascertain why no sulphurous acid comes off at first.

In two experiments there was an average of 30 per cent. silica and 0·19 per cent. copper found in the slag. The experiments and analyses are considered to confirm Le Play's observation of the existence of the so-called sulphosilicates in regulus. It is stated that in the ore furnace in the Swansea process copper regulus is frequently entangled in the imperfectly fused matrix. The products are far better fused, however, when the oxidation is effected with great rapidity, as in Hollway's process. The heat thus evolved in the oxidation is very great. In one of the Penistone experiments, with several tons of protrosulphides on the hearth, when the product was turned into the steel ingot moulds, it poured like water, escaping in a stream from the small crevices where the base of the mould touched the ground, and great quantities of sulphurous acid and nitrogen passed off at a temperature of near 1000°C.

ROTARY DRY ORE CONCENTRATOR.—Mr. E. W. Stephens, of Erie, Pa., has employed his ingenuity in adding another dry ore concentrator to the fast increasing list of that class of machines. His invention is the result of practical observation and of experience in the concentration of lead ores. The Erie Dispatch describes it as follows:—The machine is an iron frame supporting an endless belt of wire cloth, which, by means of pulleys, is passed over an ore bed in which an horizontal blast plate or fan acting vertically, operated by a lever and spiral spring, gives intermittent air impulses at a rate not exceeding 500 strokes a minute to a stratum of ore resting upon the cloth, thus affecting a concentration of the heavy minerals contained in the ore from the associated rock, by the action of specific gravity. The specific gravity of rocksand is about 2½, of iron ore 6, galena 7½, copper, 9, silver 9, and gold 19. The material in order to be treated over an air concentrator must first be crushed to about the size of wheat, then dried in ovens, and then divided into separate sizes by sieves or screens. This ends the preparation of the ore. After being passed over the concentrator and the mineral separated from the rock, skimming knives at the forward end of the machine separate the concentrated strata as the wire cloth belt is revolved, the lighter passing over the knives into one receptacle and the heavier mineral passing below the knives into another receptacle stationed at convenient distances in front of the machine. The capacity of a machine having a 2 by 3 ft. blast plate, or fan would be 6½ tons per hour. It is claimed that this is many times in excess of the capacity of any ore separator of similar dimensions hitherto in use. In other dry ore concentrators, similar to that tested by the Pacific Concentration Company last November, the ore is compelled to pass over a stationary ore bed, thus limiting the capacity to a practical working of about 1000 lbs. per hour. In this rotary machine, however, the ore remains stationary upon the ore bed, and is then concentrated and removed from it by the revolution of the endless belt, and the capacity is practically unlimited, as it depends entirely upon the length of the belt, which may be made to pass over a frame containing a series of an indefinite number of blast or fan plates. It is claimed that a length of 60 ft. of belt exposing about 20 ft. to the simultaneous action of the fans would be the best practical working capacity. The capacity of such a machine would be about 60 tons an hour, and the cost of concentration, exclusive of preparatory work, would in that case not exceed 5 cents per ton. It is intended for use in separation of all minerals associated with a large quantity of rock, such as lead, copper, and silver, and also for iron ore where found associated with sand, as it is in a number of counties in this State, in the Lake Superior region and at points on the Atlantic seaboard, and in the separation of gold sands. It is claimed that the advantages of air over water as a separating medium for ores, is very decided on account of the superior elasticity of air, rendering it practicable to give four times the number of impulses per minute that can be given by water, and also the freedom from lateral current, which in the case of the finer sizes of ores causes great waste.

NEW COMPOSITION FOR CASTINGS.

An improved composition for mould casting, cementing, and coating has been invented by Dr. E. MEYER, of Cöpenick, near Berlin, the process of producing it being based on the formation of that double decomposition which an alkaline silicate (soluble glass) undergoes with combinations of fluorine in the presence of water. It is carried out in different ways, as, on the one hand, fluor-spar, cryolite, or generally all combinations of fluorine in the form of powder, either alone or with the addition of other powder forming substances; on the other hand, soluble glass powder, or solution of soluble glass of varying densities, is either mixed to a thick or thin paste, with or without the addition of water, and then poured, some in moulds or cement joints, and some coated over the respective surface, or single coats are laid on one after the other alternately.

In accordance with the method of application any desired mineral powder or colour may be added to the fluor-spar and soluble glass for the purpose of preventing the cast composition from shrinking, and for increasing the amalgamation together, the firmness, and the hardness, and to provide the objects with any desired colour in a durable manner. A greater or less degree of density of the solution of soluble glass is necessary, according to the degree of porosity of the objects to be treated. As examples of the multifarious uses of this chemical reaction between fluorine combinations and soluble glass Dr. Meyer mentions that an intimate mixture in the same proportions of powder-forming fluor-spar and sand gives, either by itself or mixed with mineral colours (which must not however be disturbed by alkalies), on being stirred up with a solution of soluble glass of 1·25 to 1·3 specific gravity a paste which can be poured into elastic glue moulds, and after a short time, and without shrinking or spreading out, it becomes a hard substance, unaffected by the atmosphere, and representing the exact outline of the moulds; can be used as cement for joints; and as a coating for wood, pasteboard, brickwork, stone, metals, &c.; it adheres firmly and durably. When the powder is mixed to a paste with water, and applied as a coating like paint, after the latter is dry, the same object is attained by going over it with a concentrated solution of soluble glass, as by this means the coating becomes firm and durably fixed on the lower ground; such easily executed paintwork is perfectly weatherproof. In the same manner any object, the consistent parts of which are over its surface mixed in with fluor-spar powder, may be hardened by treatment with solution of soluble glass. Papier mache, clay, potters' earth, powdered plaster of Paris, &c., when they are previous to the casting mixed with fluor-spar powder, cryolite, or afterwards gone over with a fluor-spar mixture, give products (paper, pasteboard, ornaments, utensils, potters' goods, plaster of Paris figures, &c.) which, without necessitating burning, &c., become hard by treatment on the surface with solution of soluble glass, and are waterproof. A mixture of two parts gypsum and one part fluor-spar powder is cast like pure gypsum, and afterwards hardened by soluble glass. In the same manner he may use for many purposes a mixture of ground soluble glass and fluor-spar, which after treatment with water becomes hard under the same chemical reaction.

Ornaments and castings of any desired form may be produced by going over the interior surface of the moulds by means of a brush with a mixture of fluor-spar powder with concentrated soluble glass, and strewing sand over the paste whilst it is still soft. After it becomes hard it is again gone over by means of a brush with a paste of fluor-spar and soluble glass, and sand again strewed thereon, and so on until sufficient strength is obtained. It will be understood that for all these objects any other fluorine combination besides fluor-spar or cryolite may be used; also that the chemical decomposition of the latter with soluble glass may be used for other than the objects mentioned. The relative proportions of the mixture may also be varied in many ways. All kinds of soluble glass coatings are rendered much more valuable and durable by the application of fluorine combinations, the injury often done by alkali salts is prevented, and the durability of the coating is increased. The general and useful employment of soluble glass as a protection from fire will be due to the addition of fluor-spar, because this coating may be easily and durably applied to all combustible stuffs, as also in any desired colour.

MANUFACTURE OF ZINC OXIDE.

The greater salubrity of zinc white as compared with white lead as a pigment has constanty been referred to during the last 20 years, and there is little doubt that in point of economy zinc white has also the advantage. Some further improvements have now been invented by Mr. E. A. PARNELL, of Swansea, and consist in the conversion of sulphate of zinc into zinc oxide by moderate heat in contact with deoxidising agents. When the zinc oxide is required in a white state for use as a paint the zinc sulphate has to be carefully freed from those metallic oxides, the presence of which would communicate colour to the zinc oxide, particularly oxides of iron, manganese, and copper. The elimination of these oxides he effects by the methods known to chemists, and usually practised for the purification of zinc sulphate when prepared from zinc ores by calcination and lixiviation, with or without the addition of sulphuric acid to the calcined zinc ore. He next mixes the purified sulphate of zinc with powdered wood charcoal in the proportion of 1 part of charcoal to about 12 parts of dry or actual zinc sulphate, or 22 parts of the crystallised sulphate. The admixture of these materials is most conveniently effected by adding the charcoal to the melted crystals of zinc sulphate, the mixture being heated and stirred until it solidifies. Sawdust and other carbonaceous materials may be used in this operation, but preference is given to wood charcoal. He next heats the mixture of zinc sulphate and charcoal to dull redness, taking care to avoid free access of atmospheric oxygen. The zinc sulphate is thereby decomposed, sulphurous acid gas is disengaged, together with carbonic oxide and carbonic acid gases, and the zinc remains in the state of oxide.

It is desirable that in this operation the heat should not exceed dull redness. At a higher temperature the mechanical condition of the zinc oxide is not so fine. There is also a risk at a high temperature of the production of sulphide of zinc and metallic zinc, which is not the case when the heat does not exceed dull redness. The heating of the mixture of zinc sulphate and charcoal may be conveniently performed in earthen retorts, similar to coal gas retorts, or else in a close muffled furnace. No stirring is necessary. The operation is complete when sulphurous acid gas is no longer disengaged. The remaining zinc oxide is cooled slowly if it is found to contain any undecomposed zinc sulphate; this is removed by washing with water. When dried the oxide is ready for use.

In preparing zinc oxide for the purpose of manufacturing spelter and for other applications where purity and whiteness are not essential Mr. Parnell employs the crude solution of zinc sulphate obtained by the lixiviation of calcined zinc ores, with or without the addition of sulphuric acid, and instead of wood charcoal he employs small coal as the reducing agent in the proportion of 1 part of coal to about 10 parts of dry zinc sulphate or 18 parts of crystallised sulphate. This mixture is heated moderately as above described in a closed muffled furnace or an earthen retort. An open reverberatory furnace may, however, be made use of for this operation, provided care is taken to avoid excess of atmospheric oxygen. In such case a little extra coal should be added to the zinc oxide occasionally, so long as that addition is found to cause disengagement of sulphurous acid. Instead of mixing the carbonaceous deoxiding material in a solid state with the zinc sulphate it may also be employed in the state of gas or vapour. In this manner coal gas, gas from Siemens's "producer," and derived from volatile compounds of carbon and hydrogen may be applied as the reducing agent,

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